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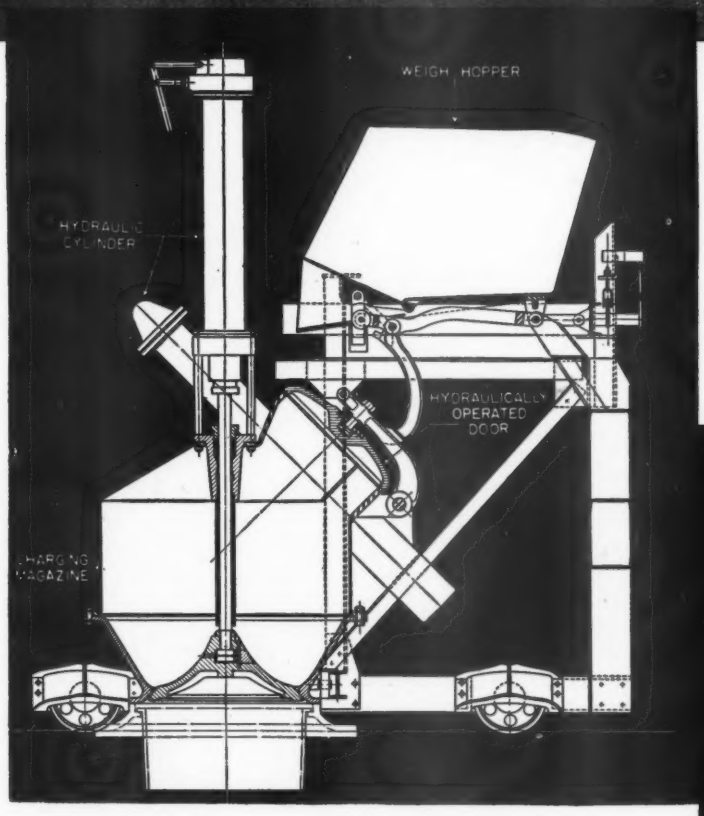

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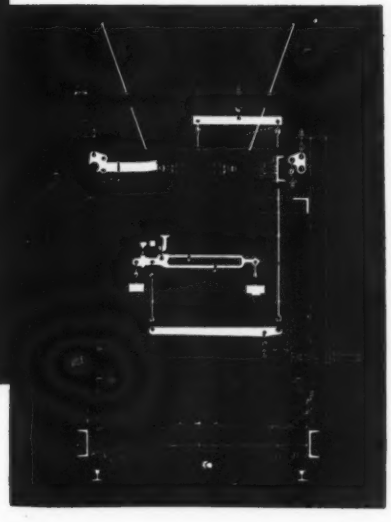

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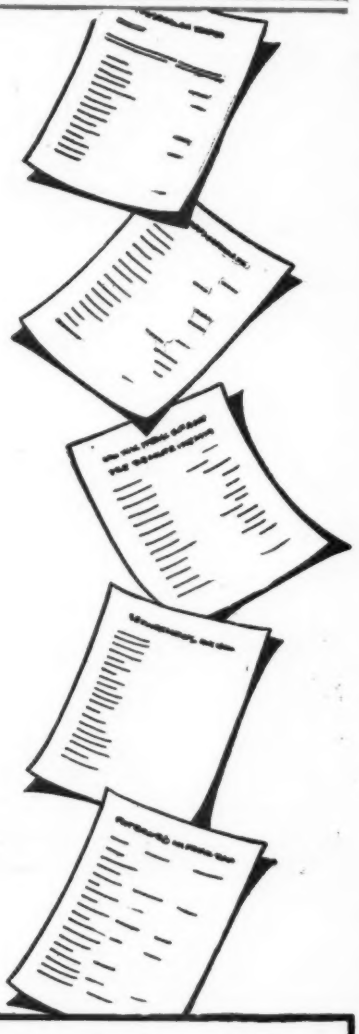

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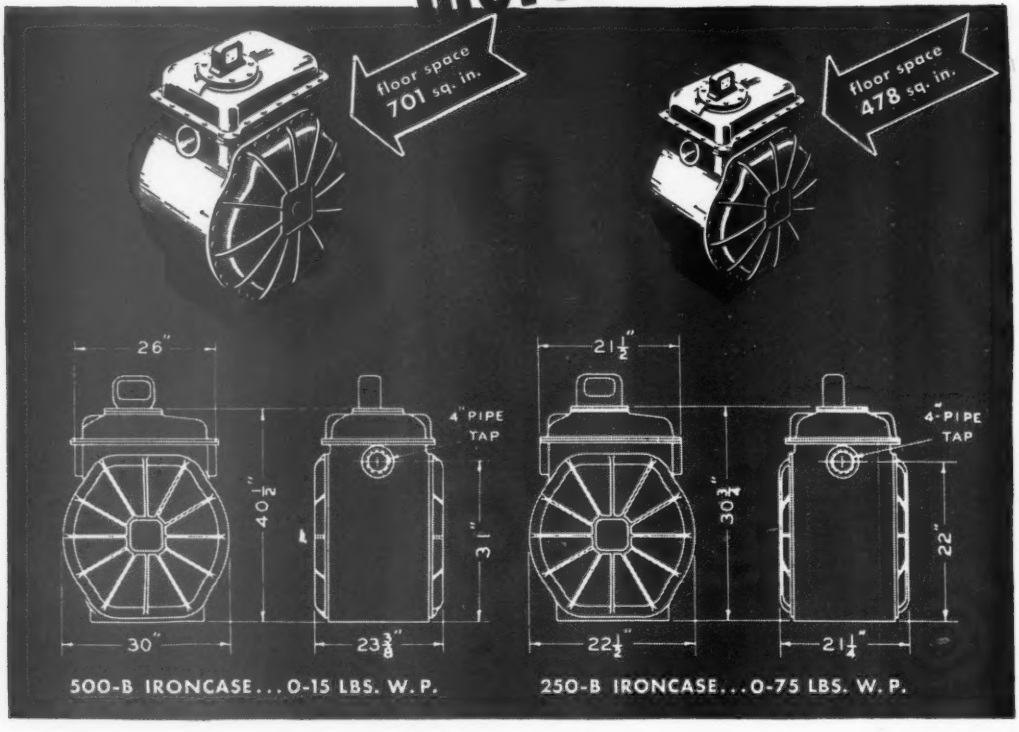

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MARCH 1945

AMERICAN GAS JOURNAL

VOLUME 162 NO. 3

How French Gas Industry Aids Vital War Effort

It Speeds Industry At Critical Time

By Jay G. Coutant

THE PURCHASING of foreign coal ruined French industry for a time but through thrift there has slowly emerged one industry—Gas—to be helpful in our war effort.

It is not generally known that only 50 million tons of coal are mined annually in France, while the home consumption approximates 80 million tons during good times. It therefore necessitated:

1:—The purchase of foreign coal, a procedure ruinous to national economy;

2:—Conservation of coal by utilizing all coal waste and by-products from the combustible taken out of the mines:

3:—Further economies made necessary in distribution and utilization, all of which have been developed and are ready to serve our forces on request.

The coal resources of France are located in the north and east, and are found in numerous seams reaching to considerable depth. The seams in the north average two feet and in the east say seven feet thick. They are not horizontal but are inclined at an angle of 12°. Only a few mines in the east are mechanized. The coal is usually hand mined by compressed air, picks and shovels, then loaded in shaker-conveyors to belt conveyors and small mine cars which are lifted by the shaft hoist 1500 to 2200 ft. to the surface.

The loading, shaking, dropping and screening of the friable coal and foreign matter makes cleaning a necessity.

Five percent of the coal is air washed and 80% is water washed. The resulting waste combustible as slimes and dust are pulverized and burned in steam boilers for the generation of electricity, or used for fuel briquets, or for the manufacture of gas and used to improve metallurgical and domestic coke.

Fuel Briquets

Several mines in the Nord and Pas-de-Calais have special equipment for making smokeless fuel briquets which manufacture has reached a production of 7½ million tons annually.

The Gas Plants have included in their manufacture *Boulets,* (fuel briquets) for use in gas generators on automobiles.

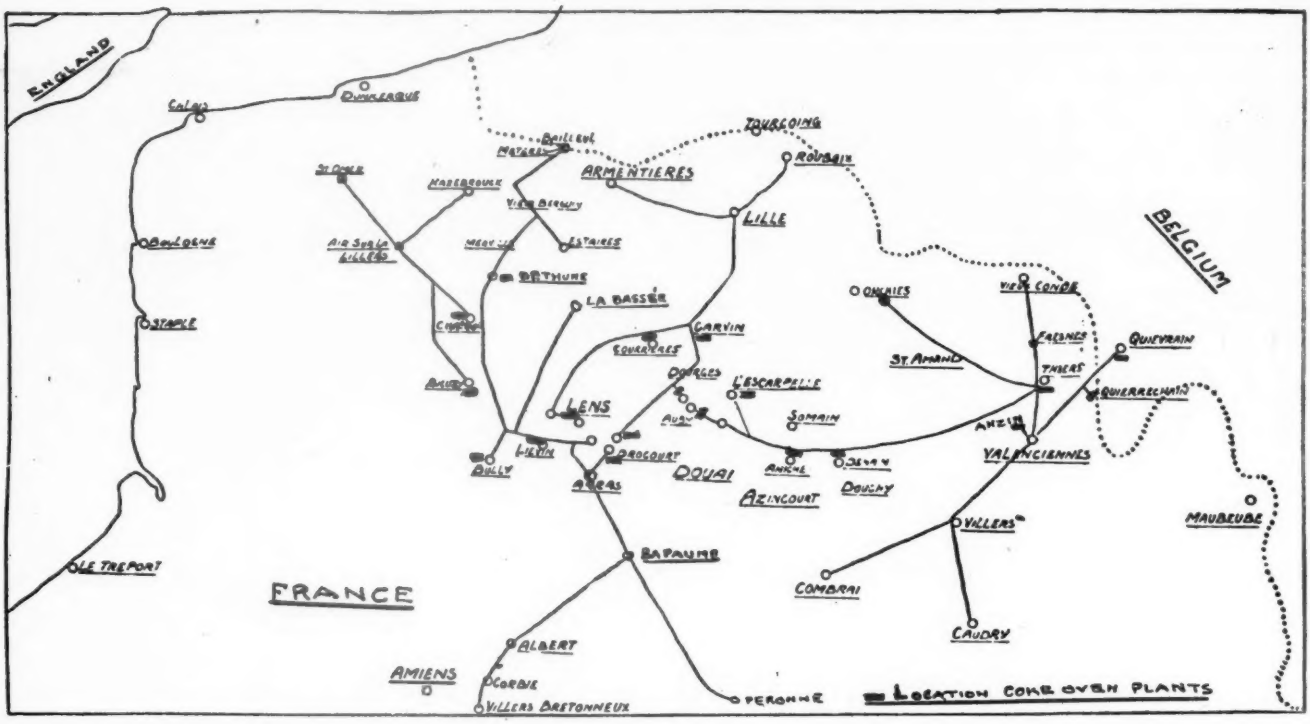
When the Germans occupied Paris 5,000 vehicles were operated in the city by gas generators instead of gasoline and more than 100,000 were in service in the French Empire using this fuel. The automobile manufacturers, Panhard, Berliet, Latil, Unic, Renault, etc., preferred to sell in July 1939 only those new motor cars equipped with this fuel.

It was estimated that fixed equipment for briquetting, buildings, trucks, tractors, gas generators, labor and organization for supplying briquet gas per year for 10,000 trucks would involve a revolving fund expenditure of 90 million francs ($450,000). This capital expenditure would make the importation of 26,420,000 gallons of gasoline worth 300 million francs ($1,500,000) unnecessary. The gasoline would be replaced by gas plant manufactured briquets at a cost to the motor car owners of 60 million francs ($30,000) equivalent to gasoline at 11¼ cents per gallon. It is not surprising then the motorcar manufacturers preferred to make this new fuel type of car.

Low Temperature Carbonization

At the mines in the Saar and Lorraine basins they use low temperature carbonization of mine slimes for improving the quality of metal-

FIG. 1. COAL MINING AND INDUSTRIAL DISTRICT IN NORD



This territory of some 10 thousand square miles in northern France adjoining Belgium is served with interconnected gas pipeline systems. It is an important coal mining and industrial district. The locations of coke oven plants are indicated by black dash.

lurgical coke by adding the semi-coke to their high volatile coal fines. The gas obtained is very rich (932-Btu. cu. ft.) The mines of the Nord and East mix it with the coke-oven gas for enrichment before it is delivered to the high-pressure system.

Pipe-Line Gas Transport

Experience has shown that for industrial or home use, enriched coke oven gas can be transported in pipe lines at a cost which compares favorably with other means of transportation of fuel but with the exceptional advantages conducive to health, cleanliness and beauty. The transmission losses are very low in comparison with high tension electric current losses and motor or railroad transport.

The economic success of a system depends on a large quantity being available for distribution. This has been assured since France has a considerable shortage of metallurgical coke. The coke-ovens are usually located in the vicinity of the coal mines. The Northern distribution system is shown in Fig. 1. The Saar plebiscite of 1920 to 1935 was under French administrators who operated 45 coal mines with coke-oven plants which had an approximate production of 7,500,000 tons of coke in

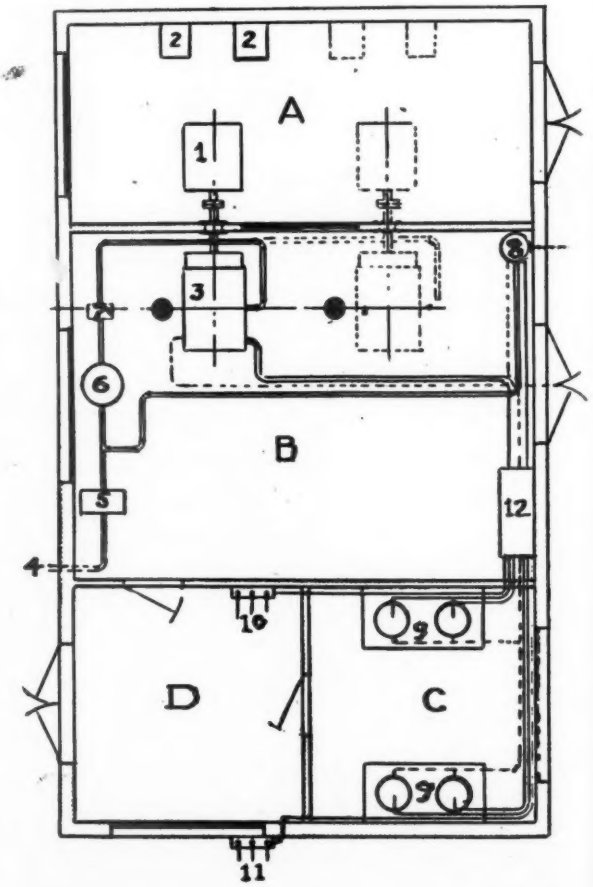


FIGURE 2
COMPRESSOR STATION

A. Electric Motors & Apparatus Room
B. Gas Compressor Room
C. Gas Receiver Room
D. Recharge Room of Stock Bottles
1. Electric Motor
2. Electrical Apparatus
3 High Pressure Compressors
4. Incoming Gas Pipe
5. Gas Meter
6. Anti-Pulsationer
7. Gas Filter
8. Benzol Decanter
9. Gas Receivers
10. Ramp for Charging Bottles
11. Ramp For Charging Vehicles
12. Operating & Control Panel

1943. It is reasonable to believe France will again rehabilitate the Saar Basin and extend high pressure pipe lines to all thickly populated centers for domestic and industrial purposes.

In the Moselle and Loire-Lorraine coal fields are gas pipe lines of equal importance to those in Nord. Within a radius of 80 miles around Paris there are 2000 miles of distribution mains owned by one company.

Paris, Lyons, Orleans and other large populated areas within the coal regions of France will all be interconnected in the same way as the electric power systems of today.

The gas pipeline transmission of coal fired energy is the most economical means for the delivery of fuel to the consumer. It will be an important factor toward stabilizing French national economy.

CAR OPERATES ON NEW LIQUID FUEL

Georges Claude, outstanding French scientist is seen beside a car operated with ammoniac acetylene gas. The two containers of this fuel, mounted on the rear of the car enable it to travel over 3000 miles without recharging. This vehicle was presented to the Institute of France in 1941.

Variety of Uses for Gas

Enriched coke oven gas has been put to a variety of uses in France, one of the most important developments has been its increased use in competition with fuel oil and coal. Viz:

Gas for retreading of tires, where the molds for forming the treads and vulcanizing of automobile tires are heated with high pressure steam.

This problem was met by Parisian engineers who made a small automatically gas fired horizontal steam boiler containing 10 gallons of water, built for a working pressure of 90-lbs. per sq.in. The boiler maintained a pressure of 60 to 70-lbs. with 6 tire molds in service. Last year an American boiler was sold to the French Michelin Company for retreading of tires on the Isle of Martinque. This was a 15 hp. Clayton Steam Generator.

Compressed Coke Oven Gas

Used instead of gasoline and Diesel oil for motor transport, this became an actuality for many thousand trucks in 1939, when numerous charging stations were constructed at populated centers and war industrial plants. The gas compressors at gas plants at cities of Limoges, Paris, Colmar and Bethume had compressors built for a capacity of 120 cu. ft. per minute and a pressure of 3,500-lbs. per sq. in. Others at the gas plants at Waziers, Landy, Thionville, Bethume and Neubourg supplied gas at 2,850-lbs. per sq. in. A typical compressor station layout is shown Fig. 2.

The price of the gas at Strasbourg is the equivalent of 62 cents per 1000 cu.ft. The compressed gas in automobile reservoir is sold at 74 cents per 1000 cu. ft. (about 525 Btu. gas).

Sale of Bottled Compressed Gas

This offers to the gas industry of France new fields for development. Important trials made in the City of Cambrai where compressed bottled gas was delivered from a Paris gas plant and burned for industrial purposes proved to be an economic success.

In isolated areas such as farm, country, camp, etc., compressed gas in bottles can compete with any other means for light, heat and power or for automotive or stationary power plants.

It is estimated that 42 bottles having an interior volume of 1.42 cu. ft. each, will serve 180 customers and can be delivered by a 3 ton truck. A battery of 420 bottles will serve for an annual distribution of 2,120,000 cu. ft. to small domestic consumers.

Utilization of Coke Breeze

With coke breeze introduced into an electric furnace in combination with lime for the manufacture of acetylene, a high grade motor fuel for long distance travel has become a recent achievement.

Ammoniac Acetylene absorbs heat on formation. This heat is evolved in burning and adds to heat generated by the combustion of its constituent elements. It is the highest flame temperature gas fuel and is supplied in semi-liquid state in containers.

Conclusion

Tremendous savings are made in the transportation of fuel energy from source of gas supply at mines to compressor stations and large consumers, consideration being given to burning equipment, labor, operating engineers and overhead expense.

With the additional profits from by-products of coal, it does seem that the French Gas Industry is capable of aiding our vital war effort and will also build a National Economy more stable than before.

Flow Equations for Gas Considering Deviations From Ideal Gas Laws

By
W. O. Clinedinst
Engineer
National Tube Company
Pittsburgh, Pennsylvania

ONE of the earliest organizations to transport natural gas was The Fredonia Gas, Light, and Water Works Company of Fredonia, N. Y. It is reported that for years its service was confined to communities near the gas fields, for the early wooden gas lines, turned and bored from random lengths of logs, were prone to leak and did not lend themselves to distant transmission. At that time an investigation of the effect of deviations from ideal gas laws on flow equations could have had little but academic interest.

The advent of the use of steel pipe opened the way to higher operating pressures and has made the present day long distance gas transportation line a reality. With pipe representing 40 to 70 per cent of the cost of gas lines, its efficient use is a dominant factor in overall economy. Since the size, weight, and grade of pipe required to transport gas are determined by means of flow equations for estimating capacity, such equations should result in the most accurate estimate possible. Errors on the conservative side lead to expenditure of more money than necessary for pipe. On the other hand, to overestimate capacity will result in the line not performing the service intended.

The effect which deviations from ideal gas laws may have on flow equations has passed beyond the stage of academic interest, and if disregarded, may lead to reduction in efficiency and overall economy.

Flow Equations for Gas Considering Deviations from Ideal Gas Laws

Part I

Development of Flow Equations

Flow equations, such as Weymouth's, generally used for estimating capacities of gas lines, disregard deviations of natural gases from the ideal gas laws. For low pressures this is not likely to be of much importance. However, in considering the economics of higher pressures than presently used for gas lines, it would appear advisable to investigate the effect of such deviations on the flow equations.

Extensive studies of deviation of natural gases from the ideal gas laws have been made,[1] [2] and it has been found that the deviations can be approximated by a compressibility factor Z introduced into the equation representing ideal gas laws as follows:

$$PV = Z\,N\,R'\,T \quad \ldots\ldots\ldots (1)$$

where

P = pressure, in lb./sq. in. absolute
V = volume in cu. ft.
Z = compressibility factor
N = number of lb. — moles of gas = $\frac{\text{Weight of Gas in lbs.}}{\text{Molecular Weight}}$
R′ = Universal gas constant = 10.71 for cu. ft. lb/sq. in.
T = temperature, absolute = 460 + °F.

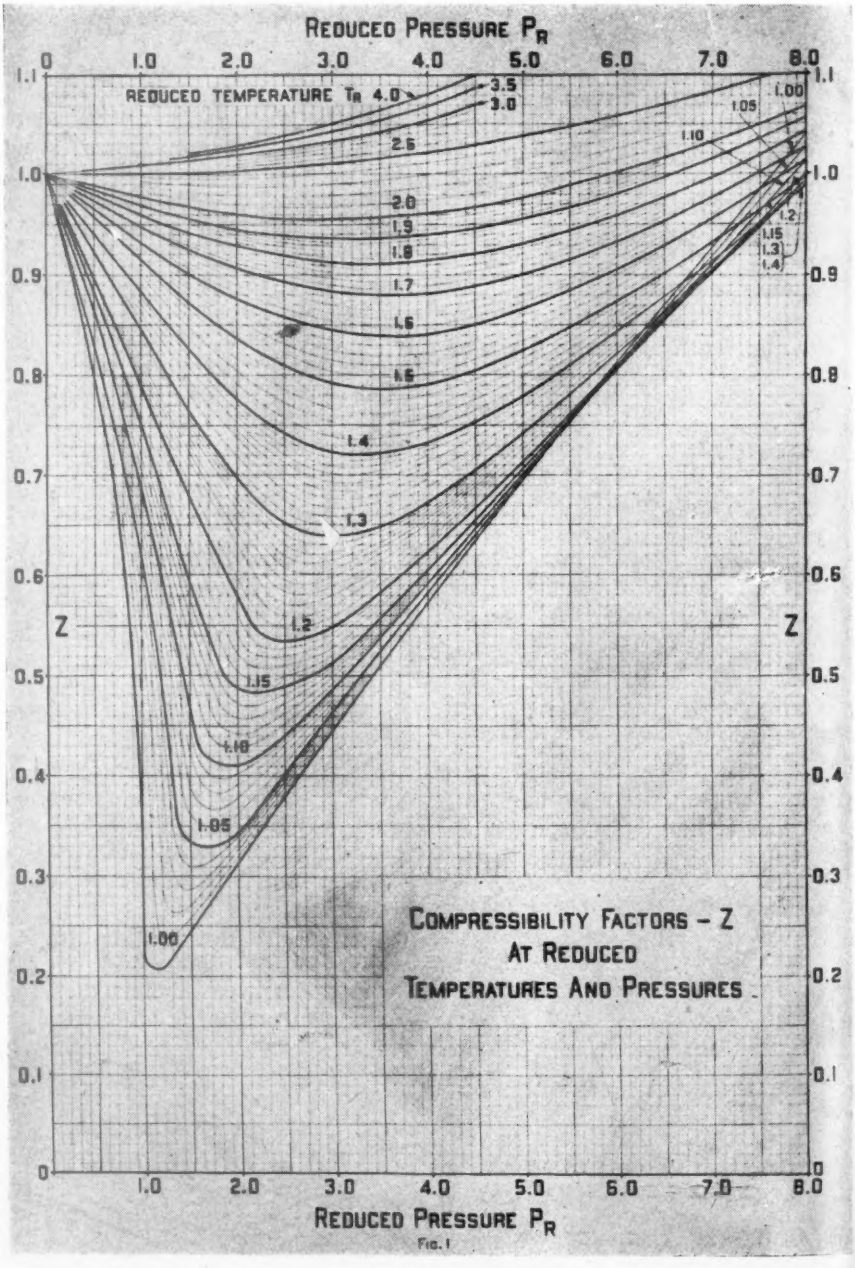


FIG. 1

It is to be noted that equation (1) reduces to the equation of ideal gas laws when the compressibility factor Z is replaced by unity. The compressibility factor Z has been found to be a function of the "Reduced Pressure" and "Reduced Temperature" of the gas. Curves of the compressibility factor have been determined from experimental data and have been published in treatises on this subject.[1] [2] Figure 1 shows curves of compressibility factor Z plotted against "Reduced Pressure" for various levels of "Reduced Temperature." The relationship shown in Figure 1 can be expressed mathematically as

$$Z = \phi\ (P_r, T_r) \quad \ldots\ldots\ldots (2)$$

where

P_r = reduced pressure
T_r = reduced temperature

"Reduced Pressure" P_r and "Reduced Temperature" T_r are ratios of the absolute pressure and temperature to the critical pressure and temperature of the gas components respectively. The relationship is expressed as follows:

$$P_r = \frac{P}{P_c} \quad \ldots\ldots\ldots\ldots (3)$$

$$T_r = \frac{T}{T_c} \quad \ldots\ldots\ldots\ldots (4)$$

where

P = pressure in lb./sq. in. absolute
T = temperature — absolute = 460 + °F.
P_c = critical pressure of gas or gas mixture
T_c = critical temperature of gas or gas mixture

Values of critical pressures and temperatures may be obtained from critical tables and handbooks.[1] [2] A summary of some of the generally needed ones is shown in Table I.

TABLE I

Critical Pressure and Temperatures of Fundamental Gases

Gas	Formula	Critical Pressure lb./sq.in. P_c	Critical Temperature °F. T_c
Methane	CH_4	673	344
Ethane	C_2H_6	712	549
Propane	C_3H_8	617	666
iso-Butane	C_4H_{10}	544	732
iso-Pentane	C_5H_{12}	483	829
Carbon Dioxide	CO_2	1073	548
Nitrogen	N_2	492	227
Oxygen	O_2	730	278

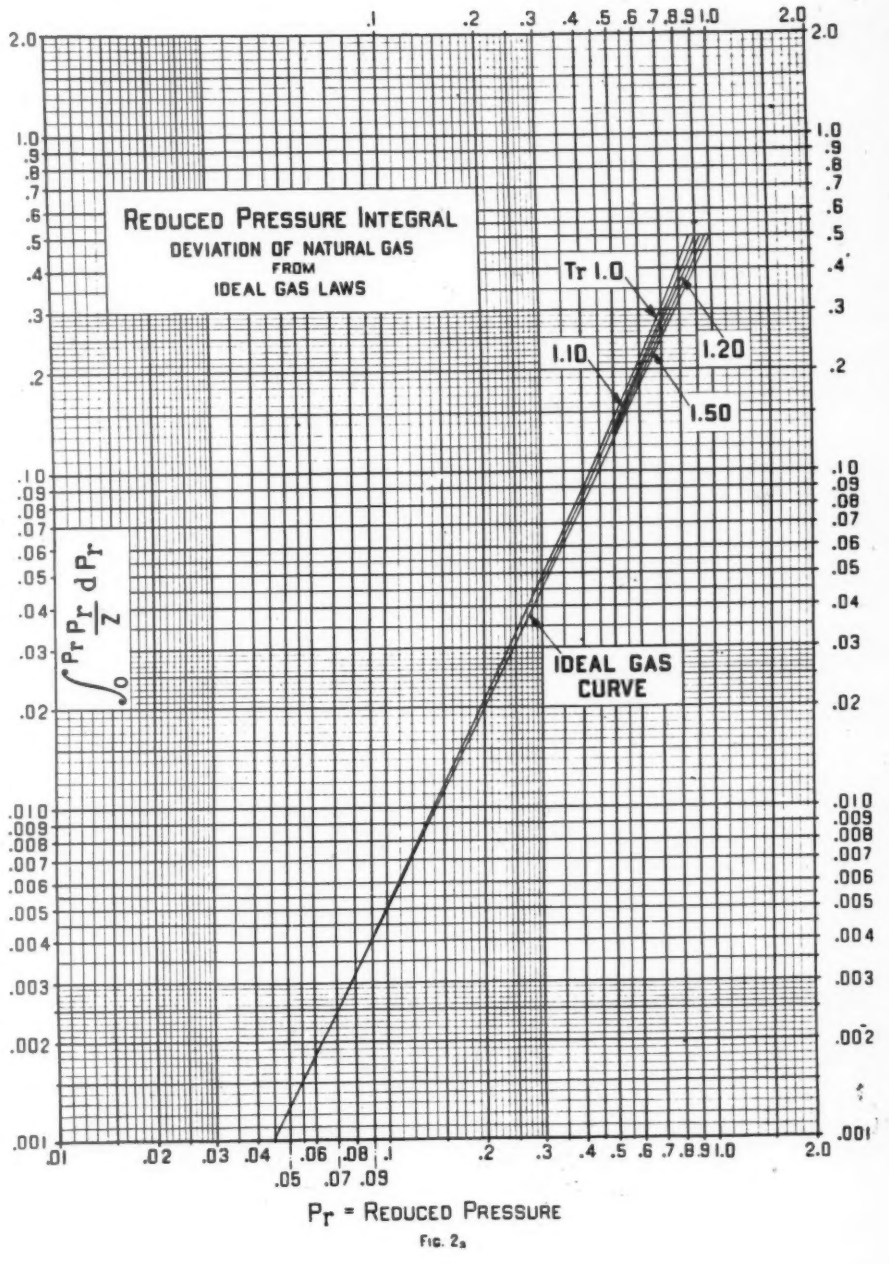


Fig. 2a

These critical values are shown for pure gases such as methane, ethane, etc. For the natural gases consisting of mixtures of the fundamental gases, recourse is made to so-called "Pseudo Critical Pressures and Temperatures." [1] [2] The "Pseudo Critical Pressure and Temperature" for a mixture of gases is related to the "Critical Pressure and Temperature" of the fundamental gases in the following manner:

$$P_c = (P_c)_a N_a + (P_c)_b N_b + \ldots (5)$$
$$T_c = (T_c)_a N_a + (T_c)_b N_b + \ldots (6)$$

where

N_a = Gas (a) of gas mixture as a volume fraction
N_b = Gas (b) of gas mixture as a volume fraction
P_c = pseudo critical pressure of gas mixture
$(P_c)_a$ = critical pressure of N_a
$(P_c)_b$ = critical pressure of N_b
T_c = pseudo critical temperature of gas mixture
$(T_c)_a$ = critical temperature of N_a
$(T_c)_b$ = critical temperature of N_b

Let us examine the differential equation of the gas flow pressure gradient:[3]

$$\frac{d\,(p + \gamma h)}{dx} = \frac{-f}{D}\,\frac{\gamma v^2}{2g} \quad \ldots\ldots (7)$$

"Throughout this article atmospheric pressure has been taken as 14.65 lb. per sq. in."

where

f = coefficient of friction of the gas in the line (see Figure 3) (Sometimes the coefficient of friction is expressed with a value ¼ of f)
D = inside diameter of pipe in ft.
g = acceleration due to gravity = 32.17
h = elevation variation in ft.
p = gas pressure in lb./sq. ft. absolute
v = velocity of gas in the line in ft./sec.
x = length along the line in ft.
γ = weight density of gas lb./cu. ft.

The usual assumptions that are made when integrating equation (7) to obtain gas flow formulae are as follows:

1. Ideal gas laws apply.
2. Steady flow, i.e., the weight passing through every section of the line is the same.
3. Isothermal flow.
4. No variation in elevation.

The purpose of this paper is to determine the effect of changing assumption 1 to consider deviations of natural gases from the ideal gas laws. The revised assumption follows:

1. Gas laws expressed as equation (1).
2. Steady flow—i.e., the weight passing through every section of the line is the same.
3. Isothermal flow.
4. No variation in elevation.

Revised assumption 1 is expressed by equation (1) modified as follows:

$$\gamma = \frac{p\,M}{Z\,R'\,T} \quad \ldots\ldots\ldots\ldots (1a)$$

where M = molecular weight
R′ = universal gas constant (for all gases) = 1543 for cu. ft. lb./sq. ft.

Assumption 2 of steady flow may be expressed

$$C = \frac{\gamma\,\pi\,D^2}{4}\,v \quad \ldots\ldots\ldots\ldots (8)$$

where C = constant

Assumption 3 states that temperature T is constant throughout the line —i.e., it is not a function of x the length along the line.

Assumption 4, that elevation is constant, may be expressed

$$\frac{dh}{dx} = 0 \quad \ldots\ldots\ldots\ldots (9)$$

Substituting equations (1a), (8), and (9) into equation (7), we obtain:

$$\frac{dp}{dx} = \frac{-f\,C^2\,T\,R'Z}{2g\left(\frac{\pi}{4}\right)^2 D^5\,M\,p} \quad (10)$$

Separating variables in equation (10) and integrating, equation (11) follows:

$$\int_{p_1}^{p_2} \frac{p}{z}\,dp = -\int_0^l \frac{f\,C^2\,T\,R'\,dx}{2g\left(\frac{\pi}{4}\right)^2 D^5\,M} \quad \ldots\ldots\ldots\ldots (11)$$

where
l = length of line in ft.
p_1 = entrance pressure in lb./sq. ft. absolute
p_2 = exit pressure in lb./sq. ft. absolute

Completing the integration indicated for equation (11) we obtain:

$$\int_{p_2}^{p_1} \frac{p}{Z}\,dp = \frac{f\,C^2\,T\,l}{2\left(\frac{\pi}{4}\right)^2 g\,D^5}\,\frac{R'}{M} \quad \ldots\ldots (11a)$$

Equation (8) can be rewritten in terms of discharge rate in cu. ft. per second as follows:

$$C = \gamma_o\,Q_{sec} \quad \ldots\ldots\ldots\ldots (8a)$$

where
γ_o = weight density of gas at standard condition lb./cu. ft.
Q_{sec} = discharging rate in cu. ft. per second at standard condition

Substituting equation (8a) into (11a) and rearranging, the basic equation for discharge rate follows:

$$Q_{sec} = \frac{\pi}{4}\sqrt{\frac{2\,g\,D^5\int_{p_2}^{p_1}\frac{p}{z}\,dp}{f\,\gamma_o^2\,T\,l}\,\frac{M}{R'}}$$

replacing γ_o^2 by $\frac{p_o^2}{Z_o^2\,T_o^2}\,\frac{M^2}{(R')^2}$ from (1a)

$$Q_{sec} = \frac{\pi}{4}\,\frac{Z_o\,T_o}{p_o}\sqrt{\frac{2\,g\,D^5\int_{p_2}^{p_1}\frac{p}{z}\,dp}{f\,T\,l}\,\frac{R'}{M}} \quad \ldots\ldots\ldots\ldots (12)$$

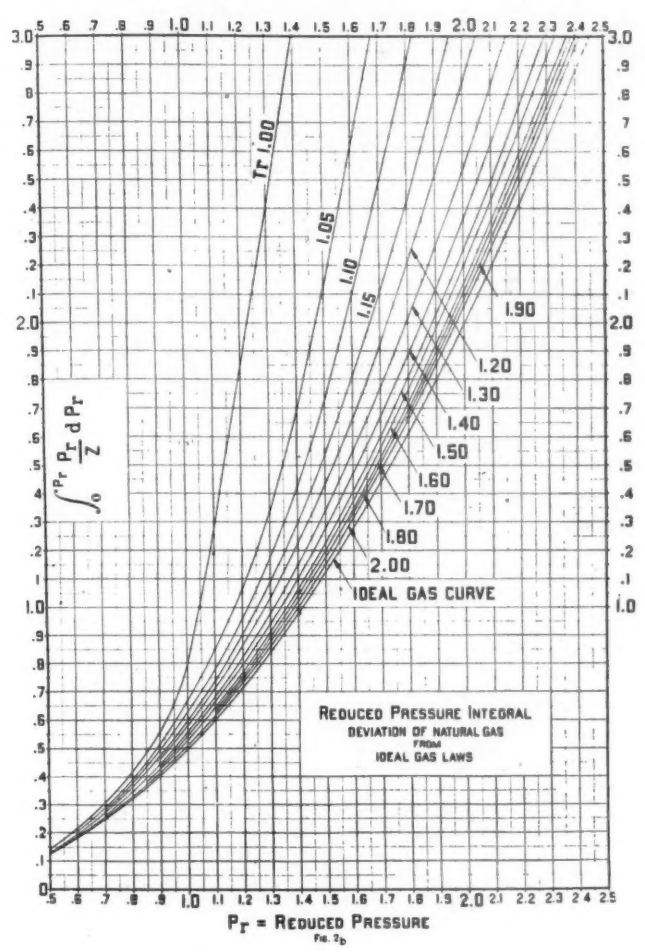


Fig. 2b

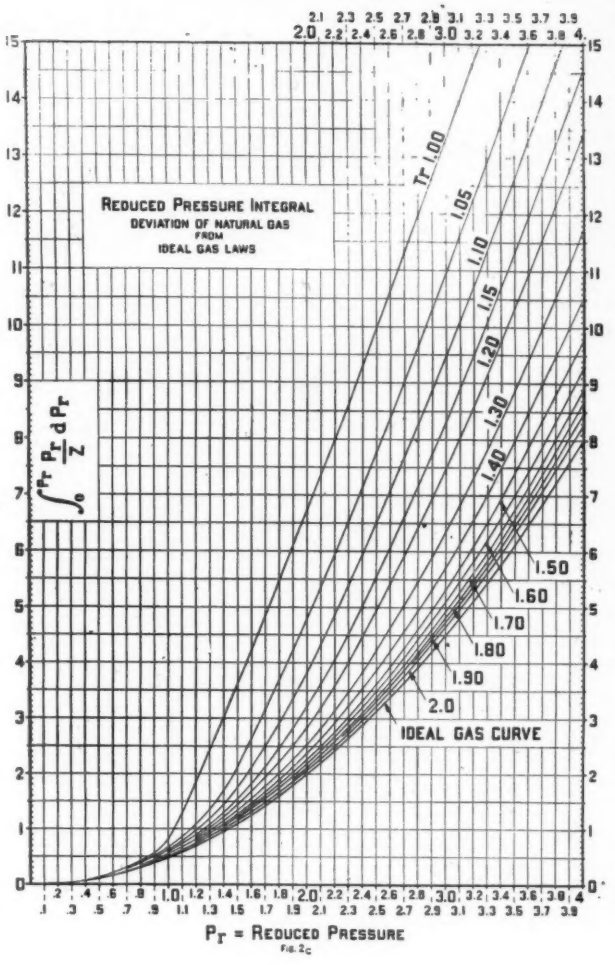


Fig. 2c

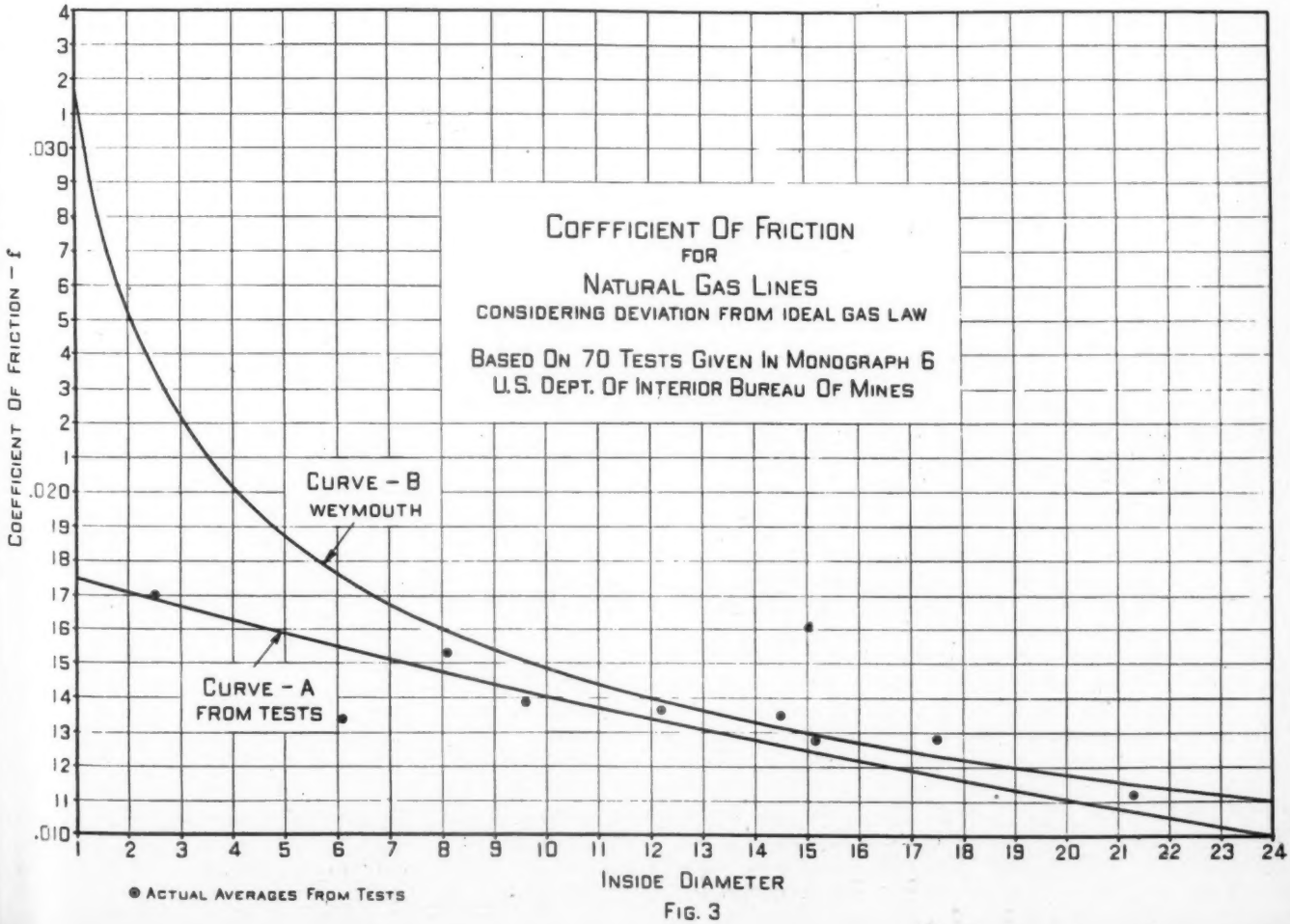


Fig. 3

but $\frac{R'}{M} = \frac{R_a}{G}$

R_a = air constant = 53.33

Rewriting equation (12) in terms of commonly used units, we obtain:

$$Q_{day} = 109.6622 \frac{Z_o T_o}{P_o} \sqrt{\frac{d^5 \int_{P_2}^{P_1} \frac{P}{z} dP}{f G T L}} \quad (12a)$$

where

Q_{day} = capacity in cu. ft per day at standard condition
d = inside diameter of pipe in inches
G = Specific gravity of the gas referred to air
Z_o = compressibility factor at standard temperature and pressure
P_1 = entrance pressure in lb./sq. in. absolute
P_2 = exit pressure in lb./sq. in. absolute
T_o = standard temperature °F. absolute
P_o = standard atmospheric pressure in lb./sq. in. absolute
L = length of line in miles
T = flowing temperature of the gas °F. absolute
f = coefficient of friction (See Part II) from Fig. 3

For gases following the ideal gas laws, equation (11) reduces to the following well-known expression:

(Equation 13)

$$Q_{day} = 77.544 \frac{T_o}{P_o} \sqrt{\frac{(P_1^2 - P_2^2) d^5}{f G T L}}$$

In the case of gases deviating from the ideal gas laws it becomes necessary to determine values of Z and to evaluate the pressure integral $\int_{P_2}^{P_1} \frac{P}{Z} dp$. It becomes convenient to express pressures and temperatures as reduced pressures and temperatures. To do this it is first necessary to determine the pseudo critical pressure and temperature of the gas mixture by means of equations (5) and (6). Using the pseudo critical values so obtained, equations (3) and (4) are employed to obtain the following:

P_{r_1} = pseudo reduced entrance pressure
P_{r_2} = pseudo reduced exit pressure
T_r = pseudo reduced temperature

The pressure integral can be rewritten in terms of reduced pressure and critical pressure as follows:

$$\int_{P_2}^{P_1} \frac{P}{Z} dP = P_c^2 \int_{P_{r_2}}^{P_{r_1}} \frac{P_r}{Z} dP_r \quad \ldots\ldots\ldots\ldots (14)$$

Let us define the reduced pressure integral by the following equation:

$$\int_{P_{r_2}}^{P_{r_1}} \frac{P_r}{Z} dP_r = \int_{o}^{P_{r_1}} \frac{P_r}{Z} dP_r - \int_{o}^{P_{r_2}} \frac{P_r}{Z} dP_r \quad (15)$$

Values of $\int_{o}^{P_r} \frac{P_r}{Z} dP_r$ were obtained by numerical integration from Figure 1 and the curves of the resulting integrals are shown in Figures 2a, 2b, and 2c.

Part II
Friction Factor and Use of Equations:

Values of the friction factor f used in the usual Weymouth's formula were obtained by analysis of existing gas lines without consideration being given to deviation from ideal gas laws.[4] The Weymouth's friction factor is written as follows:

$$f = \frac{.032}{d^{1/3}} \quad \ldots\ldots\ldots (16)$$

Since most of the existing flow data have been on gas with relatively low pressures, the Weymouth friction factor could be used as a first approximation for use with equation (12a). However, it appeared advisable to re-examine available data, considering deviation from ideal gas laws, to determine a more suitable friction factor. Analysis of the flow data published in Bureau of Mines Monograph 6, U. S. Department of the Interior,[4] results in an estimated friction factor shown in Curve A Figure 3.

This friction factor is a semi-logarithmic curve, the equation for which follows:

$$\log_{10} f = -1.7447 - .010637\, d \quad (17)$$

The plot of Weymouth's friction factor is also shown in Figure 3.

It will be noticed that the friction factor is dependent on the inside diameter of the pipe. In the consideration of friction factor from the standpoint of the more classic fluid dynamics, [3] it is to be expected that friction factor would be a function of Reynolds' Number and the roughness coefficient.

Reynolds' Number is expressed:

$$\text{Reynolds' Number} = \frac{v D}{\nu} \quad \ldots (18)$$

where

v = mean velocity in ft. per sec.
D = inside diameter in feet
ν = kinematic viscosity in ft.²/sec.

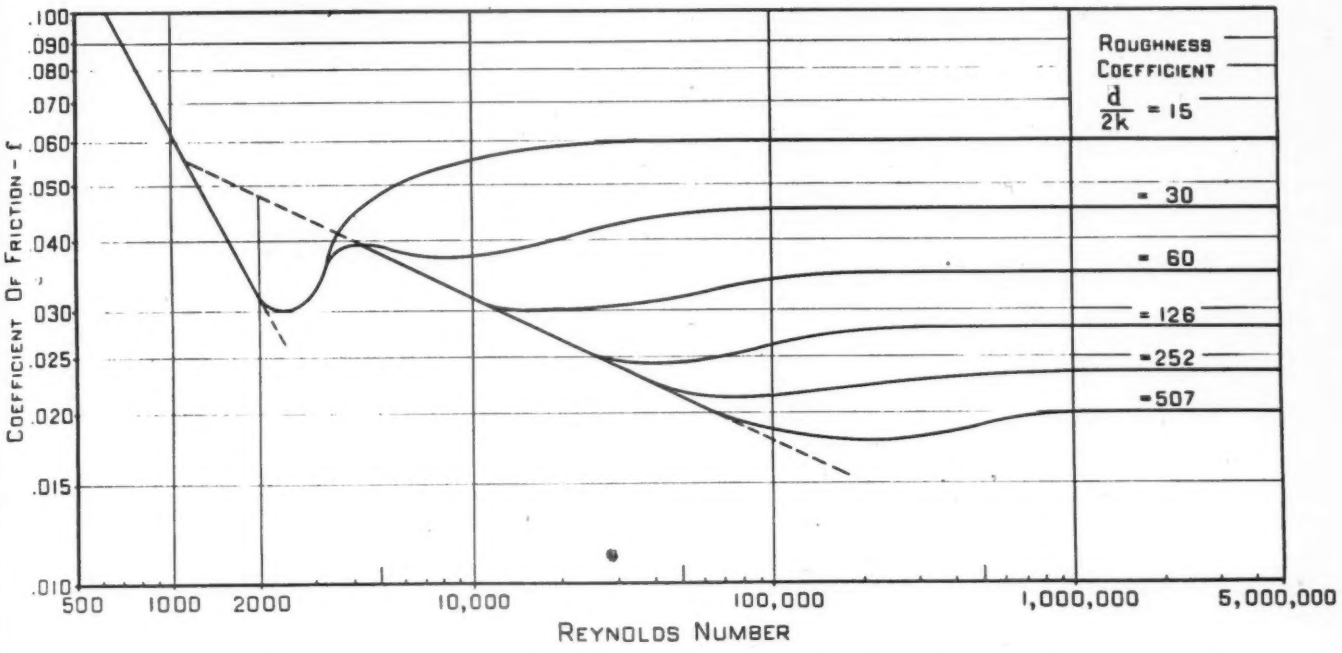
The roughness coefficient is expressed:

$$\text{Roughness coefficient} = \frac{d}{2k}$$

where k = roughness in inches

Figure 4 shows a plot of friction factor against Reynolds' Number for various levels of roughness obtained artificially by sand grains.[3] It is seen from the plot that for the high Reynolds' Number generally encountered in gas lines, which range from 150,000 to 5,000,000, the friction factor is practically independent of Reynolds' number and dependent only on the roughness coefficient. Little is known about the roughness of pipe and the effect of the particular character on the friction factor. However, it is seen that if an average roughness were used for all pipe, the friction factor would become a function of diameter. Experimental investigation of effect of roughness

Coefficient Of Friction For Artificially Roughened Pipe



d = Inside Diameter; k = Grain Diameter Creating Roughness

Fig. 4

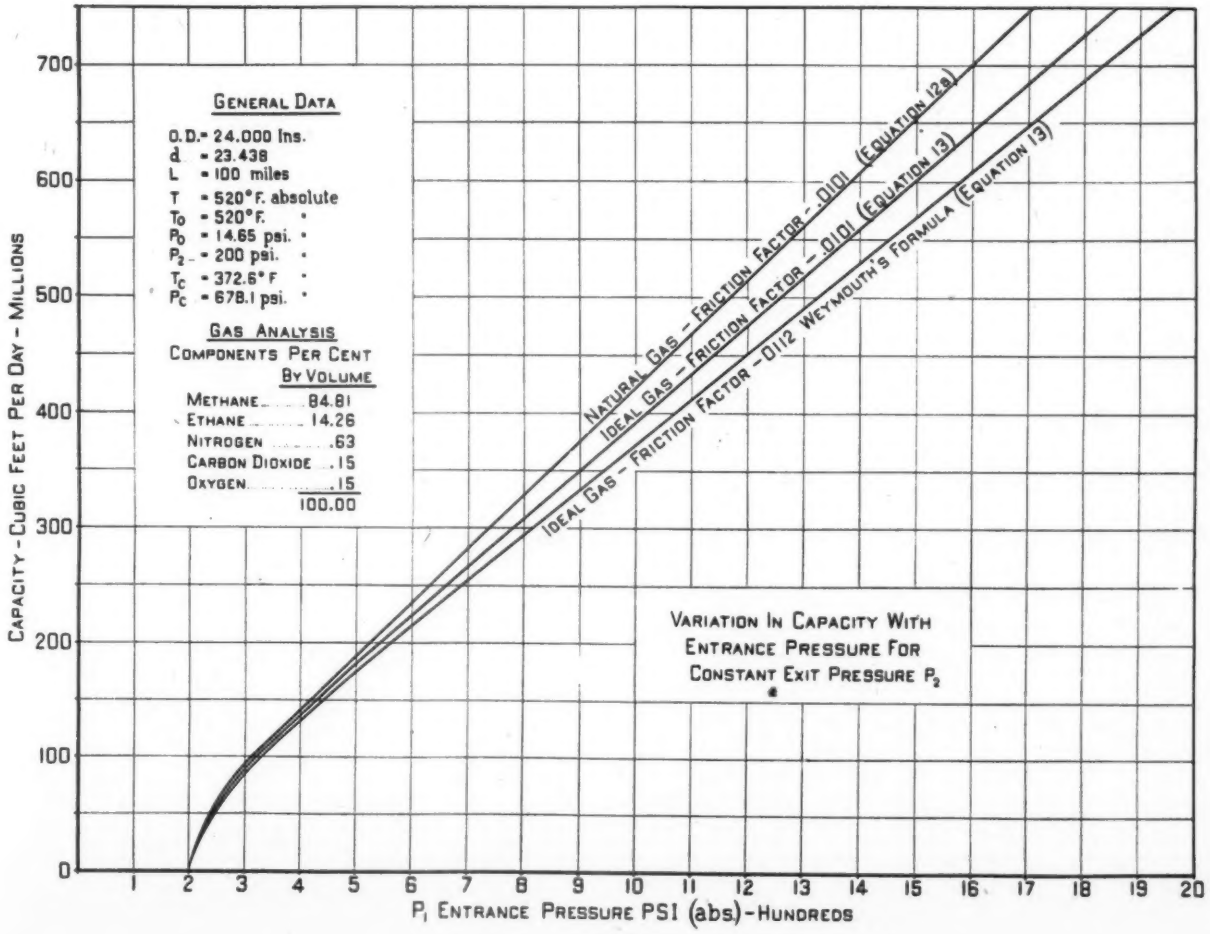


Fig. 5

of commercial pipe would likely reveal much of interest and value.

The friction factor function A of Figure 3 appears to fit the test results well and should be suitable for use until further data permit a more refined estimate. In the numerical examples to follow this friction factor function will be used.

The use of flow equation 12a, considering deviations from the ideal gas laws, is best explained by numerical examples.

Example: Determine the daily capacity of a gas line consisting of 100 miles of 24" O.D. line pipe having an I.D. of 23.438 inches. The gas to be transported has a specific gravity of .632 and analysis is as follows:

Gas	Per Cent By Volume
Methane	84.81
Ethane	14.26
Nitrogen	.63
Carbon Dioxide ..	.15
Oxygen	.15
	100.00

Standard pressure and temperature are 14.65 psi absolute, and 520 deg. F. absolute respectively. The temperature of flowing gas is 520° F. absolute, the entrance pressure 775 psi absolute, and the exit pressure 395 psi absolute.

The pseudo critical pressure and temperature must be determined by means of equations (5) and (6) and Table I:

$$P_c = (P_c)_a N_a + (P_c)_b N_b + \ldots\ldots (5)$$

$$P_c = 673\ (.8481) + 712\ (.1426) + 492\ (.0063) + 1073\ (.0015) + 730\ (.0015)$$

$$= 678.1 \text{ psi absolute}$$

$$T_c = (T_c)_a N_a + (T_c)_b N_b + \ldots\ldots (6)$$

$$T_c = 344\ (.8481) + 549\ (.1426) + 227\ (.0063) + 548\ (.0015) + 278\ (.0015)$$

$$= 372.6\ ^\circ\text{F. absolute.}$$

"Reduced Pressures" and "Reduced Temperatures" are determined from equations (3) and (4):

$$P_r = \frac{P}{P_c} \quad \ldots\ldots (3)$$

$$P_{r_0} = \frac{14.65}{678.1} = .0216$$

(Continued on page 20)

$$\int_{P_{r_2}}^{P_{r_1}} \frac{P_r}{Z}\, d\,P_r = \int_0^{P_{r_1}} \frac{P_r}{Z}\, d\,P_r - \int_0^{P_{r_2}} \frac{P_r}{Z}\, d\,P_r \quad (15)$$

$$\int_{.5825}^{1.143} \frac{P_r}{Z}\, d\,P_r = \int_0^{1.143} \frac{P_r}{Z}\, d\,P_r - \int_0^{.5825} \frac{P_r}{Z}\, d\,P_r$$

From figure 2b for $P_{r_1} = 1.143$ and $T_r = 1.4$

$$\int_0^{1.143} \frac{P_r}{Z}\, d\,P_r = .720$$

and figure 2a for $P_{r_2} = .5825$ and $T_r = 1.4$

$$\int_0^{.5825} \frac{P_r}{Z}\, d\,P_r = .174$$

The Reduced Pressure integral then becomes:

$$\int_{.5825}^{1.143} \frac{P_r}{Z}\, d\,P_r = .720 - .174 = .546$$

The pressure integral is obtained from the Reduced Pressure Integral and Critical Pressure by means of equation (14)

$$\int_{P_2}^{P_1} \frac{P}{Z}\, dP = P_c^2 \int_{P_{r_2}}^{P_{r_1}} \frac{P_r}{Z}\, dP_r \quad \ldots\ldots (14)$$

$$\int_{.5825}^{1.143} \frac{P}{Z}\, dP = (678.1)^2\ (.546) = 251{,}061$$

We are now ready to determine the capacity of the pipe line by means of equation 12a:

$$Q_{day} = 109.6622\, \frac{Z_o\, T_o}{P_o} \sqrt{\frac{d^5 \int_{P_2}^{P_1} \frac{P}{z}\, dP}{f\ G\ T\ L}} \quad \ldots\ldots (12a)$$

$$Q_{day} = 109.6622\, \frac{520}{14.65} \sqrt{\frac{(23.438)^5\ (251061)}{(.0101)\ (.632)\ (520)\ (100)}}$$

$$= 284{,}703{,}428 \text{ cu. ft. per day}$$

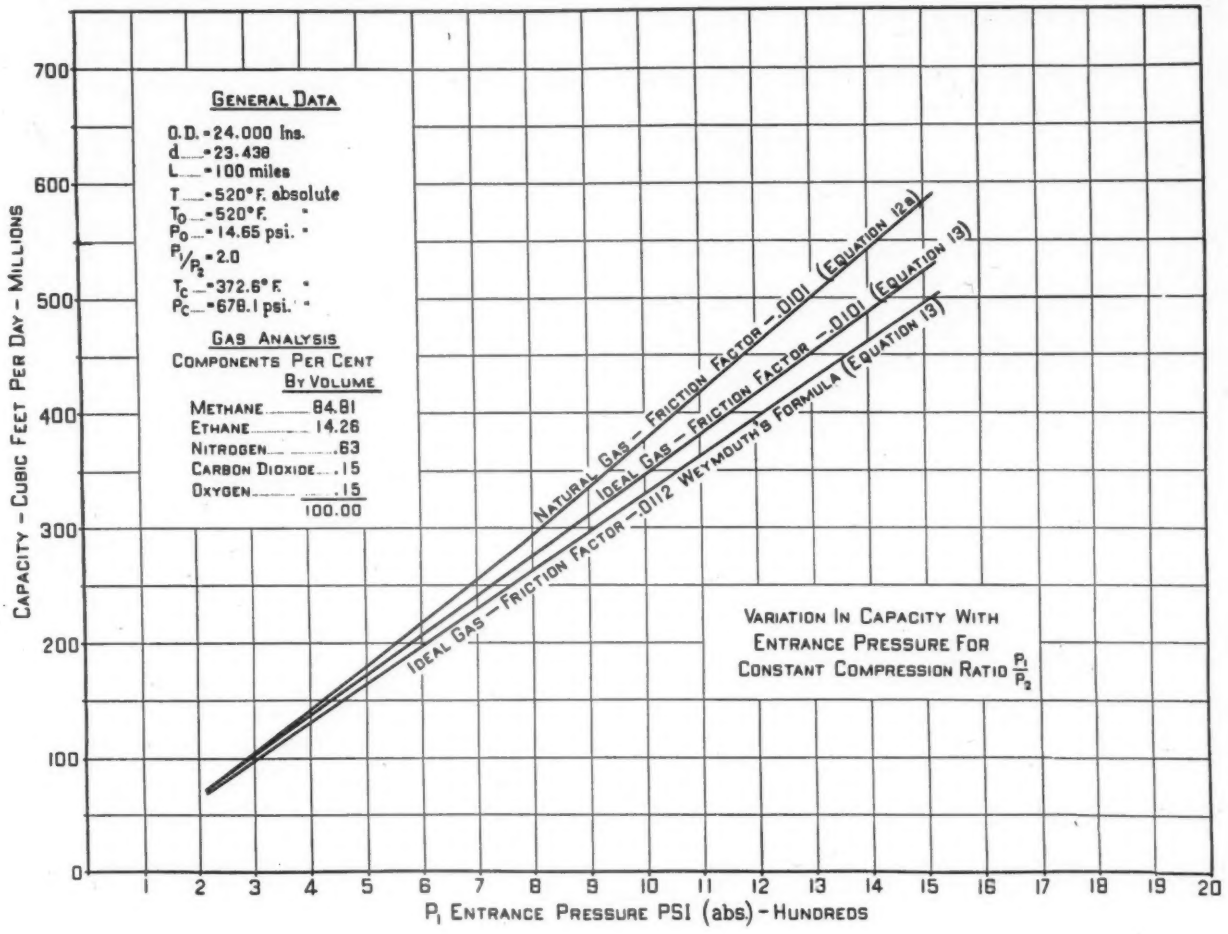

GENERAL DATA
O.D. = 24.000 Ins.
d = 23.438
L = 100 miles
T = 520° F. absolute
T_o = 520° F. "
P_o = 14.65 psi. "
P_1/P_2 = 2.0
T_c = 372.6° F. "
P_c = 678.1 psi. "
GAS ANALYSIS
COMPONENTS PER CENT BY VOLUME
METHANE 84.81
ETHANE 14.26
NITROGEN .63
CARBON DIOXIDE .15
OXYGEN .15
100.00
NATURAL GAS — FRICTION FACTOR — .0101 (EQUATION 12a)
IDEAL GAS — FRICTION FACTOR — .0101 (EQUATION 13)
IDEAL GAS — FRICTION FACTOR — .0112 WEYMOUTH'S FORMULA (EQUATION 13)
VARIATION IN CAPACITY WITH ENTRANCE PRESSURE FOR CONSTANT COMPRESSION RATIO $\frac{P_1}{P_2}$
CAPACITY — CUBIC FEET PER DAY — MILLIONS
P_1 ENTRANCE PRESSURE PSI (abs.) — HUNDREDS

FIG. 6

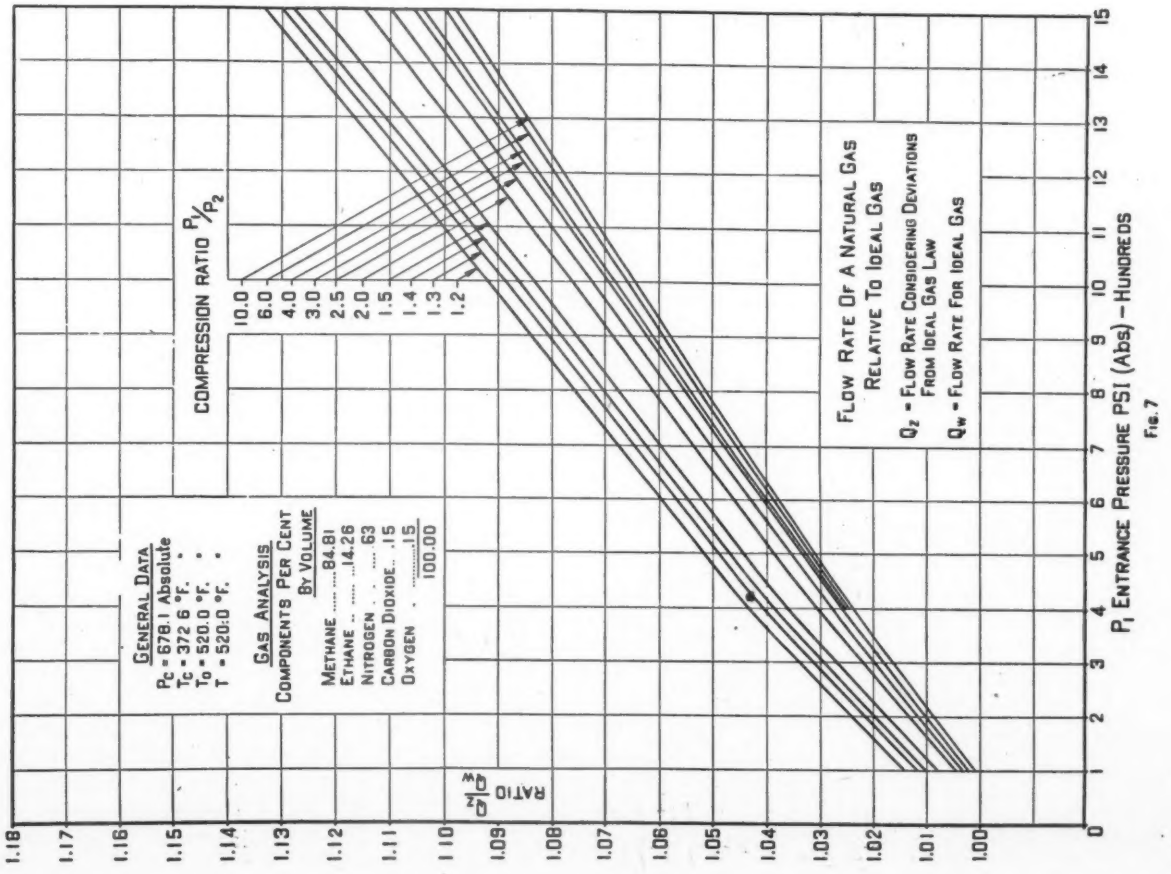

GENERAL DATA
P_c = 678.1 Absolute
T_c = 372.6 °F. "
T_o = 520.0 °F. "
T = 520.0 °F. "
GAS ANALYSIS
COMPONENTS PER CENT BY VOLUME
METHANE 84.81
ETHANE 14.26
NITROGEN .63
CARBON DIOXIDE .15
OXYGEN .15
100.00
COMPRESSION RATIO P_1/P_2
10.0 6.0 4.0 3.0 2.5 2.0 1.5 1.4 1.3 1.2
RATIO Q_z/Q_w
FLOW RATE OF A NATURAL GAS RELATIVE TO IDEAL GAS
Q_z = FLOW RATE CONSIDERING DEVIATIONS FROM IDEAL GAS LAW
Q_w = FLOW RATE FOR IDEAL GAS
P_1 ENTRANCE PRESSURE PSI (Abs) — HUNDREDS

FIG. 7

(Continued from page 18)

$$P_{r_1} = \frac{775}{678.1} = 1.143$$

$$P_{r_2} = \frac{.395}{678.1} = .5825$$

$$T_r = \frac{T}{T_c} \quad \ldots\ldots\ldots\ldots (4)$$

$$T_{r_0} = T_r = \frac{520}{372.6} = 1.4$$

From figure 1 for $T_{r_0} = 1.4$ and $P_{r_0} = .0216$ we find that Z_0 is approximate unity. This will always be the case for atmospheric pressure.

The Reduced Pressure Integral is calculated from equation (15)

(See page 18)

It is of interest to make a comparison of the flow capacities indicated by the formula considering deviations from the ideal gas laws with those indicated by commonly used formulas. For the purpose of this comparison the gas analysis, pipe dimensions, length of line, temperatures, etc., of the preceding example will be used with the exception of entrance and exit pressures.

Figure 5 shows estimated capacity of the pipe line for an exit pressure of 200 psi absolute plotted against entrance pressures up to approximated 1500 absolute. Capacities have been estimated by equations 12a and 13. Equation 12a considers deviations from ideal gas laws, while equation 13 is a commonly used general equation based on ideal gas laws. The friction factor of .0101 as determined from curve A figure 3 has been used in equations 12a and 13. The friction factor of .0112 obtained from Weymouth's formula was also used in equation 13. It is seen that the ideal gas formulas result in a conservative estimate, the difference between capacities based on ideal gas laws and those based on formulas considering deviations therefrom, increasing with the entrance pressure.

Figure 6 shows estimated delivery capacities for the same line as in Figure 5 operating at a compression ratio of 2 for various entrance pressures. Again it is seen that the flow equations based on ideal gas laws result in lower estimates of capacity than the equation considering deviations from the ideal gas laws.

Dividing equation 12a by equation 13 provides a factor which represents the increase in flow estimated by the equation considering deviation from ideal gas laws from those based on ideal gas laws. A plot of the factor is shown in Figure 7 as a family of curves for compression ratios from 1.2 to 10 for entrance pressures up to 1500 psi absolute. It is seen that for a compression ratio of 2 and entrance pressure of 750 psi absolute, the flow estimated by considering deviation from the ideal gas law is approximately 6% higher than for an ideal gas of same density. This difference increases to 11.5% at an entrance pressure of 1500 psi.

In conclusion it may be stated that the use of ideal gas laws in flow equations for estimating capacities of natural gas lines is conservative. Considering deviations from the ideal gas laws, capacity is found to increase more rapidly with pressure than indicated by ideal gas flow equations. For pressures over 500 psi it would appear necessary to consider such deviations in order to arrive at the most economic design of a natural gas line. Such consideration is not difficult since calculations are facilitated by means of the curves of figures 1 to 3 inclusive.

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(3) Fluid Mechanics for Hydraulic Engineers. By Rouse. McGraw-Hill Book Company, New York.

(4) Flow of Natural Gas Through High Pressure Transmission Lines—Monograph 6. By U. S. Department of the Interior. Bureau of Mines.

Texas Welcomes Gas Markets

Independent Natural Gas Association of America representatives and operators from Texas and surrounding States attended the Texas Railroad Commission's informal natural gas conference in Austin. In the open forum regarding reserves, production and utilization of natural gas and waste prevention measures, consensus of opinion was that Texas gas produced in conformity with Texas law, was a lawful commodity in interstate commerce; that it was neither desirable nor constitutional to prohibit its exportation.

Speakers estimated that gas reserves of Texas, at 1943 production rates, would last from 50 to 100 years, and disclosed that after interstate high pressure lines could no longer economically transport gas in interstate commerce because of declining pressures, at least one-sixth of the present reserves would remain and be available for domestic, industrial and chemical use in Texas for generations.

It was revealed that prior to the construction of big interstate pipe lines to the Panhandle area, hundreds of millions of cubic feet of natural gas were daily vented and wasted, but that since a market had been afforded and gas was worth something it was being saved and marketed.

Discussing the adequacy of Texas gas conservation statutes, some speakers thought the Railroad Commission of Texas adequately clothed with legislative authority to prevent waste. Others favored amendments and clarifications to authorize broader powers in the Railroad Commission with discretionary right to grant exceptions in hardship cases. Speakers agreed that the Commission should, under existing or amended statutes, require ratable taking to prevent waste and to protect correlative rights of operators.

W.P.B. Grants High Priority for Pipe Line to Ohio-Michigan Area

A $9,000,000 pipe line project to increase deliveries of natural gas from Oklahoma and Texas into the Ohio-Michigan area by 50,000,000 cu. ft. daily received a top War Production Board priority rating Feb. 7. The project is scheduled for completion by Nov. 1.

It involves increasing the capacity of one of the two Panhandle Eastern pipe lines between the Hugoton gas field and the Ohio Fuel Gas Co. from 500 lbs. pressure to 600 lbs. pressure by installing additional compressors. Also involved is construction of approximately 32 miles of 24-in. pipe line on the eastern end of the line to permit delivery of the additional gas into the Ohio Fuel Gas Co. system near Muncie, Ind., and near Maumee, Ohio.

Edward Falck, director of WPB's Office of War Utilities, described the project as "absolutely essential" in order to prevent interruption to war production.

What Will Make Gas Generators Last Longer?

CRYSTOLON

CRYSTOLON Brick are increasing the serviceability of water gas generators by giving exceptionally long lining life. Densely constructed of silicon carbide with a minimum of refractory bond, these brick are resistant to slag penetration, abrasion and high temperatures. Clinkers are easily removed from the dense surface of these brick — leaving the face of the brick clean and undamaged. CRYSTOLON linings not only stand up well for long periods of operating time, but also quickly pay for themselves by savings in cleaning costs alone.

NORTON COMPANY — WORCESTER 6, MASS.

Norton Longer Lasting Refractories

Utilities and Manufacturers Hold Joint Conference at Los Angeles

By
Fred A. Herr

THE PACIFIC COAST Gas Association's new policy for bringing utilities and manufacturers into closer collaboration in working out mutual problems through joint utility-producer conferences met with exceptional success at the first of such joint sessions held January 17 and 18 at Los Angeles.

A Gas Heating Council conference of the PCGA's sales and advertising section, meeting in all-day session on January 17 in the Southern California Gas Co. auditorium, was attended by 64 company heads and department supervisors representing six gas utilities, 20 heater and appliance manufacturers and a number of distributors.

Equally successful was a session of the Gas Commercial Equipment Council which met January 18 with an attendance of 32, representing seven utility firms and eight manufacturers of hotel and restaurant gas cooking equipment.

B. W. Reynolds, manager, domestic sales, Pacific Gas & Electric Co., San Francisco, was chairman of the Gas Heating Conference.

W. M. Jacobs, Southern California Gas Co., general chairman of the PCGA Committee on Improvement of Gas Utilization Equipment, defined the purpose of the new joint council setup as aiming to provide a channel for discussing objectively problems affecting both the manufacturers and the utilities. The relation between manufacturers and gas companies, Mr. Jacobs declared, is becoming better year by year. He pointed out, however, that while there has been ample opportunity for manufacturers to meet among themselves and for the utilities to meet in intra-industry conferences, there had been no arrangement that permitted utility and manufacturing elements of the gas industry to confer for joint consideration of mutual problems. The joint-council program, Mr. Jacobs said, was decided upon as a logical way of solving the problem.

Debate on CP Program

Highlighting the agenda at the gas heating council meeting was an open forum discussion on the advisability of indorsing the CP heating program for use in the territory of the PCGA.

While the basic objectives of the program—improvement of the standard of gas heating equipment, and through that, increasing the use of gas as fuel for heating—was indorsed by the council as a commendable goal, the CP program, as currently constituted, was characterized as deficient in various respects to meet local conditions.

The term "Certified Performance" drew the fire of various speakers as carrying too broad an implication of guaranty, the consensus of opinions at the conference being that *performance* cannot be guaranteed until control over installation work more effective than set forth in the present CP program is provided.

Up for debate was the key question of whether the PCGA shall endorse and participate in the CP program as at present set up. The discussion culminated in a vote taken on five questions to determine the sentiment of the council. Each of the seven utilities and 24 manufacturers represented was allowed one vote.

Opinions on CP Setup

Indicative of the council's agreement on the merit of a national movement to improve the quality of gas heating installations was the 20 to 0 vote in favor of some such program, if one can be designed that would take due consideration of local conditions as differing from conditions, in many respects, in other sections of the country.

Significant, also, was the unanimous "No" vote cast in response to the following question:

"How many of those present favor the CP heating program as now written and proposed by AGA Committee?"

Disapproval by more than 3 to 1 was also recorded against the use of the term "Certified Performance." To the question, "How many favor use of the term 'Certified Performance'?" the balloting was "No" 14, "Yes" 4, not voting 2.

Question 4: . . . "How many feel that certified inspection in the field by some established authority should be required on the installation of every gas heating job to determine if it measures up to CP requirements, this inspection to be over and above any local inspections mandatory by local ordinances?"

Result of balloting on Question 4: "Yes" 11, "No" 9.

Question 5: "Would you favor various localities establishing their own installation standards rather than having such standards being laid down nationally?"

Result of balloting on Question 5: "Yes" 18; "No" 0. Not voting, 2.

The results of the balloting have been forwarded to the AGA committee in charge of the CP program as reflecting the sentiment of the PCGA Council on Gas Heating.

In the discussion which preceded the balloting, Chairman Reynolds elicited expressions of opinion from utility and manufacturer representatives from Pacific Coast cities ranging from Portland, Ore., to San Diego, Calif. Present also in the capacity of a visitor, and providing a comparison of middle-western opinion on the subject, was E. Rosenquist formerly of Peoples Gas Light & Coke Co., Chicago.

In his introductory remarks, Mr. Jacobs stated he saw some merit in the CP program as presently constituted, but outlined several points, which many think important, to make any such program function effectively in Southern California.

"If we had a set of standards which would provide for inspection of the installation as well as of the equipment prior to installation, we would have something definite with which to work," said Mr. Jacobs. "The difficulty is that the phrase 'certified performance' has a very broad coverage. We fail to see how we can certify the performance of a unit if we have no control over, or connection with, the manner in which the unit is being installed. An adequate inspection procedure must be worked out before the CP program can be acceptable to many companies.

Obviously, in my opinion, the gas companies cannot undertake to handle the inspection of installations, particularly if the CP program expands on the scale which its sponsors hope for."

Mr. Jacobs offered the suggestion that possibly the manufacturing section of the PCGA could undertake to sponsor inspections by hiring investigators for that purpose, whose job would be to investigate and certify the jobs, with the manufacturers paying a portion of the inspection expense.

H. W. Geyer, Southern California Gas Co., offered definite objection to the term "Certified Performance." Mr. Geyer pointed out that even the best equipment can be harmed by inefficient installation. He declared that any regulations adopted should specify requirements for vents, input, etc. Too many things, Mr. Geyer asserted, can contribute to the failure of a heating system to make it practical to certify the performance of an installation without having control over factors which might cause failure.

"I recall a case in which the heating units and the installation of them was perfect," he said. "But the house was so poorly weatherstripped that the heating system failed to meet the needs of that particular homeowner."

Mr. Geyer offered that as a sample case to illustrate that the type of house construction, weatherstripping, insulation, etc., must be considered as factors that affect the success or failure of a heating system.

R. S. Logue, Ward Heater Co., Los Angeles, in announcing himself as "sold" on the CP range program, added that he thought the industry would be losing the benefit of much valuable national publicity already developed in connection with CP ranges if the "CP" idea were to be deleted from the heating program.

"I believe," said Mr. Logue, "the beneficial effects the CP range plan has had in boosting national use of gas for cooking could be extended successfully to cover heating. However, I am not of the opinion that the gas companies should direct or finance CP, unless they expressly desire to do so. I do not think the gas utilities would want to sponsor the big advertising campaign that would be required to put CP heating over. It is up to the manufacturers and distributors of heating equipment to prevail upon installers to accept the responsibility for adequate installations.

Merits of Bonded Installers Told

Mr. Logue advanced the point that a requirement for bonded dealers could be used to good advantage in advertising by the manufacturers. It would result in throwing the onus for certified performance on the manufacturers, who would be responsible for installation.

"It is common knowledge that all appliance and equipment manufacturers receive letters from dissatisfied customers complaining that a piece of equipment does not work," Mr. Logue declared. "When the product does not function, the customer writes to the manufacturer, not to the utility firm or installer. I think it should devolve upon the manufacturer to maintain quality installation as well as quality product."

L. M. Hull, Hammell Radiator Engineering Co., supported Mr. Logue's bonding idea.

"If," said Mr. Hull, "educational work to achieve that aim can be carried on effectively, a bonded program might be the proper setup to assure that installations would meet CP requirements."

At this point in the discussions, Chairman Reynolds injected the warning that a bonding plan might clash or interfere with the national CP program. A bonding plan, in Mr. Reynolds' opinion, would be impractical on a national scale but could possibly lend itself to local advertising along the lines advocated by Mr. Logue.

Stanley Johnson, Holly Heating Co., cited the objectives of CP as two-fold: To raise the standard of gas heating in the United States: and to use the improvement in standards as a basis for increasing sale of gas heating in competition with other fuels.

"Installation has been the major problem in Southern California," Mr. Johnson asserted. "Technical ignorance is the principal cause of poor installations because there is available too little technical information to enable people to make proper installations."

Mr. Johnson urged that checking of the engineering phases of installations be made a requirement, and suggested the setting up of installation standards through a central agency empowered to check the engineering on each job.

H. L. Warren, Southern California Gas Co., said:

"I gained the impression that if we want to join up with the CP program, two things will be necessary: Southern California manufacturers will have to contribute to the CP fund through the AGAEM committee; and the gas industry as a whole will have to contribute to the fund through the A.G.A. The matter of installations could be left to negotiation between the AGA committee and the manufacturers and utilities in the respective areas of the country."

Improve Equipment—Lower Price

E. M. Brickey, Fraser & Johnston Co., San Francisco, went on record as favoring the upgrading of equipment as well as installation thereof by working through the AGAEM committee. By improving equipment and lowering prices, he declared, more people would be able to afford gas heating systems. He disclosed that the industry in the San Francisco Bay area had as yet arrived at no adequate plan for policing installations.

F. U. Naylor, Pacific Gas & Electric Co., San Francisco, cited the conflicting regulations often prevailing in neighboring cities in the same district as contributory factors to the difficulty of establishing proper policing programs.

San Francisco, for instance he explained, has no municipal ordinance limiting or specifying input and output, pipe size, etc., whereas in Oakland, across the bay, heating system specifications are covered by city ordinance.

"I have always felt that ordinance regulations for heating are not legal because they have no reference to health and safety," Mr. Naylor said. "Specifications as to pipe sizing, etc., have no place in a city ordinance. The way the CP program now is set up, I do not believe it could be incorporated within a city ordinance."

A. O. Leech, Portland Gas & Coke Co., sketched conditions in the Oregon area, stating that while at present there has been little public acceptance of the CP idea, the Pacific Northwest probably would "go along" with the national CP program when it has been worked out completely.

"Only about 10% of the home owners in Portland use gas for house heating," Mr. Leech said, "the market there being a selective one. We have been making inspections of installations for several years through the gas company, which works along this line.: All furnace installers must be certificated, and upon being consulted by a prospective customer, give him the assurance that only a heater approved by the gas company will be installed."

Inspection Works in San Diego

Commenting on conditions in the San Diego, Calif., area R. J. Phillips, San Diego Gas & Electric Co., declared inspection of heating installations has worked out fairly well in that area.

"We do not go to the length of definitely guaranteeing performance for any length of time," he said, "we aim to put in as good a heating system as possible and design its installation to conform most effectively to the house for which it is intended. With a good system and a good installation, good heating seems to follow as a matter of course."

Concerning gas heating in general in San Diego, Mr. Phillips said: "Whether or not San Diego Gas & Electric Co. will attempt to increase its heating load after the war, depends upon the gas supply that will be available to the Company."

Others who participated in the discussion included James L. Hess, Nago Manufacturing Co.; C. L. Slater, Ideal Heating Co.; and William Hoyt, Day & Night Mfg. Co.

At the afternoon session of the Gas Heating Council, H. W. Geyer, Southern California Gas Co., gave an analysis of the recommendations for postwar house heating appliances as presented in the report of the Committee on Improvement of Gas Utilization Equipment of the PCGA (an abstract of this report appeared in the December, 1944, issue of *American Gas Journal*).

31 Companies Represented

The following gas utilities and heater-appliance manufacturing firms were represented at the conference:

Southern California Gas Co., Southern Counties Gas Co., San Diego Gas and Electric Co., Coast Counties Gas & Electric Co., Portland Gas & Coke Co., Pacific Gas & Electric Co., Fraser Johnston Co., International Sales Co., General Controls Co., Hammel Radiator Engineering Co., Rheem Mfg. Co., Nago Mfg. Co., Payne Furnace & Supply Co., Utility Appliance Corp., Western Stove Co., Holly Heating Co., O'Keefe & Merritt, Monarch Heating Co., Coleman Lamp & Stove Co., H. R. Basford Co., Servel, Inc., Ideal Heating Corp., Titan Valve & Mfg. Co., Grayson Heat Control Ltd., Ward Heater Co., Crane Co., English & Lauer, Inc., Day & Night Mfg. Co.

Commercial Cooking Council Meets

The Gas Commercial Cooking equipment Council of the PCGA met in a conference room of the Southern California Gas Co. building in morning and afternoon sessions on January 18. R. D. MacMahon, general supervisor, commercial sales, Southern California Gas Co., was chairman.

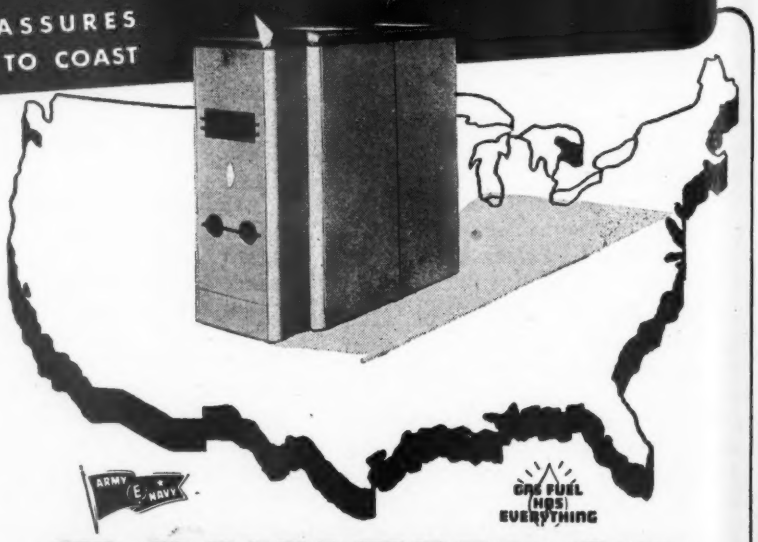
A. O. Leech, Portland Gas & Coke Co., served as discussion leader in the forum debate which followed conclusions of a reading of Sections 6, 7 and 8 of the PCGA report on "Recommendations for Postwar Appliances," dealing with roasting and deck ovens, commercial broilers and deep fat fryers.

Chairman MacMahon briefed the purpose of the discussion as an attempt to map desired objectives without necessarily working out the solutions at the meeting. Recommendations approved by the council are to be incorporated in a supplement to the recommendations for postwar gas appliances which has already been published by the PCGA.

Manufacturers were urged to give consideration to the following proposals in their design of postwar commercial cooking equipment:

Payne ZONEAIR

PRE-WAR PERFORMANCE ASSURES
POST-WAR PREFERENCE — COAST TO COAST



Building load for gas companies, sales for heating dealers . . . and good will for both . . . PAYNE gas furnaces have been associated with advanced design and engineering leadership for 30 years. ★ Post-war models will be improved, of course . . . but gradually, soundly, and only after exhaustive tests. And they will be ideally adapted to . . .

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ZONE-CONDITIONING

. . . a progressive development of the time-tried PAYNE "Unit" heating system: Winter air-conditioning and cooling summer ventilation, *controlled by zones or rooms.* Write for new ZONE-CONDITIONING booklet

ARMY E NAVY

GAS FUEL (HOS) EVERYTHING

PAYNEHEAT

30 YEARS OF LEADERSHIP

Payne FURNACE & SUPPLY CO., INC., BEVERLY HILLS, CALIFORNIA

Use rust-resistant lining for ovens; consider making the entire oven construction of non-resistant material; give proper consideration to the use for oven construction of the various alloys of metal that will be available after the war.

Tests on Venting Hoods

H. L. Warren, Southern California Gas Co., outlined the status of experiments being conducted in the laboratory operated jointly by his firm and Southern Counties Gas Co. on venting hoods for kitchen equipment. He explained, also, plans contemplated for conducting tests on restaurant hoods and the correlation of data affecting the design and installation of restaurant type hoods.

Mr. Warren asserted that the experiments are aimed at developing a device that will vent a hood at high velocity and small air volume so as to eliminate costly fan and duct installations.

Discussion of the Peterson ventilator was allotted a 15-minute spot on the agenda.

Clyde Potter, Southern California Gas Co. and member of the PCGA committee on publicity and advertising, reviewed the association's 1945 advertising program.

The committee will have a $46,000 budget at its command in 1945 as compared with $39,000 in 1944, Mr. Potter reported.

"The war," he said, "has changed some of our advertising ideas and has turned attention to the postwar need of according appliances and equipment their proper niche in our advertising schedule. Now is the time for the industry to begin an aggressive offensive in the promotion of the use of gas."

"Ceramic Broiling" Popularized

The council discussed the value of "Ceramic Broiling," a term featured in 1944 PCGA advertising. The general public's unfamiliarity with the word "ceramic" was cited as a disadvantage, while others at the session regarded that factor of value in creating an advertising slogan. It was disclosed that after only one year of emphasis on the slogan, some San Diego restaurant operators now are featuring "Ceramic Broiled Steaks."

The suggestion was made to Mr. Potter that the committee emphasize deep fat fryers and food warming equipment in its current year's advertising in order to combat electric competition in that field.

A review of servicing problems as related to improvements in commercial cooking equipment was presented by Forrest Naylor of Pacific Gas & Electric Co.

Mr. Naylor submitted the thought that, in general, the gas industry is prone to be too complacent about hotel and restaurant business because the greater portion of that business is already in the hands of the gas industry.

"Too many in our industry have adopted an attitude that seems to say 'We've got that business tied up, gas costs less, why bother?' And because saturation is relatively high, they feel it unnecessary to do much about that business. This is a dangerous attitude to take."

Gas utility firms and commercial cooking equipment companies represented at the council meeting included the following:

Portland Gas & Coke Co., San Diego Gas & Electric Co., Southern California Gas Co., Coast Counties Gas & Electric Co., Pacific Gas & Electric Co., Southern Counties Gas Co., and Pacific Lighting Corp.

Wolf Range Mfg. Co., James Graham Mfg. Co., Grayson Heat Control Ltd., Madsen Iron Works, J. C. Pitman & Sons, Inc., General Controls Co., American Stove Co., Standard Gas Equipment Corp.

A Unique Gas Service

THERE is a 200-foot-high cliff in Southern California heated by gas. Known as the "Heated Hill," this phenomenon exemplifies in striking manner one of the more unusual ways in which the gas industry has been called upon for service.

The "Heated Hill' is part of the Santa Monica Mountains which extend seaward from Hollywood. The range terminates in a sheer cliff overlooking Roosevelt Highway at the ocean's edge. The highway runs northward from the city of Santa Monica.

Gas is employed in an ingenious manner to heat a portion of the cliff to keep it from crumbling and slipping into the Pacific Ocean.

Some 20 years ago, Miss Mary V. McCormick, daughter of the Chicago harvesting machine manufacturer, built a costly mansion on the top of the cliff overlooking the sea. A 75-foot expanse of landscaped gardens and lands extends to the very edge of the high bluff, which drops 200 feet sheerly to the roadside.

Soon after the house had been completed, the cliff began to crumble, causing a substantial section of the garden to drop toward the ocean. Fearing that slides might eventually endanger the house, Miss McCormick engaged engineers to devise a means of stopping the erosion. Investigation disclosed that the cliff was composed of layers of clay and that the slippage was caused by seepage of water from above. Removal of the moisture, the experts decided, would make it possible to "dry out" the cliff and stop the slides.

The plan they offered was approved by Miss McCormick. A 1200-foot-long tunnel was thereupon driven parallel with the face of the cliff and about 90 feet back from it. At intervals along this main tunnel a series of drain pipes was inserted running from the tunnel to the face of the cliff.

The plan for "drying out" the mountain side called for the use of gas. A gas furnace, backed by a large blower fan, was installed at the mouth of the tunnel to drive air heated by the furnace through the length of the 1200 foot channel.

The gas furnace was specially designed for the purpose. It is constructed of brick, is equipped with three Nemic upshot burners, and is fully automatic with thermostatic controls. Its purpose is to heat a large volume of air to 160° to 175°F. This heated air is then forced through the tunnel by the fan to "dry out" the hill, thus eliminating the water which caused the hill first to crumble and then to break off in chunks.

The gas furnace with its unique hot air piping system has been operating with complete success for a number of years. Slippage of the cliff is reported to have stopped entirely.

The house, a beautiful two-story Spanish structure of white stone walls and red tile roofs, was unoccupied for some time after the death of Miss McCormick. It now serves as a Merchant Marine Rest Center, one of two such establishments operated on the West Coast for the rehabilitation of merchant seamen who have been physically and mentally incapacitated by active service on the high seas.

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Reynolds builds a Regulator for every type of Gas Control. Long life, efficient operation, accurate regulation, reasonable cost, low upkeep — all of these are vitally important features built into Reynolds Gas Regulators. Reynolds is proud of its leadership through more than half a century of service. Our Engineering Department will gladly work with you to solve your Gas Control problems. Write.

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So the "percentage" in it for you is that you actually save money by using Lavino Activated Oxide. You get better results, quicker—which means fewer changes of box contents, less handling of material, a saving in transportation charges.

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Cottrell Electrical Precipitation as Applied to the Manufactured Gas Industry

By

K. H. Cree

Research Corporation
New York, N. Y.

History and General Application

THE PRINCIPLE of electrical precipitation is neither complicated nor new. It is recorded that as early as 1771 observations were made on electrical discharges through smoke filled gases. Considerable interest was shown by a number of scientists during the early periods in the precipitation of suspended matter in gases and about 1850 it was observed that if a wire charged with static electricity were plunged into a jar filled with smoke, each portion of the smoke would become deposited on the sides of the jar.

While most of this early work was strictly experimental, it was not until 1883 that Sir Oliver Lodge carried on more extensive investigations. These investigations necessarily were limited to small scale operations because of the lack of the required high voltage producing equipment. However, it was not until 1905 that Dr. Frederick G. Cottrell began his experiments using modern high voltage generators for conducting a series of experiments which finally led to the initial commercial application of a precipitator in an important West Coast smelter for the collection of sulphuric acid mist. The Cottrell Precipitator for detarring manufactured gases was first developed at the plant of the Ann Arbor Gas Company at Ann Arbor, Michigan, about 1914. The first commercial application recorded was on producer gas which was installed in 1916 at the Minnesota Steel Company at Duluth, Minnesota. More general applications were made in 1924 at the Denver Gas and Electric Company and at the United Gas Improvement Company in Philadelphia, Pa., where considerably more experimental work was conducted. Applications for detarring manufactured gases at the present time total approximately 275 installations with gas treated amounting to approximately 3,630,000,000 cubic feet per day.

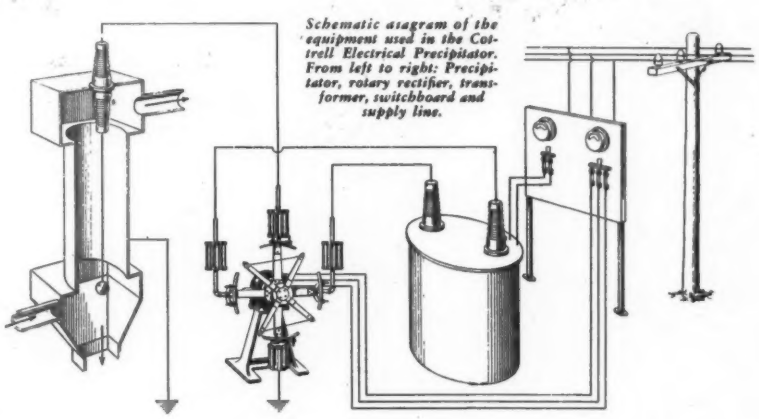
Research Corporation, which was founded in 1908 by Dr. Cottrell, has always had as one of its principal interests the abatement of the nuisance of air pollution and also the recovery of suspended matter from gases solely for their economic value. In this connection, the Cottrell Precipitator has played a major role in a great many of our important industries. Some of the outstanding applications in which the Cottrell Precipitator plays an important part are the manufacture of 100 octane aviation gasoline in the recovery of fluid catalyst, carbon black, which is used in the manufacture of synthetic rubber, aluminum, iron and steel, industrial acids, gypsum, tin and kraft paper. There are also installed more than 200 precipitators on some 220 pulverized coal fired boiler installations for the removal of fly ash from the boiler stack gases.

From the foregoing it will be appreciated that the detarring of manufactured gases represents only one of the many and diversified applications of Cottrell equipment.

The theory of Cottrell Electrical Precipitation involves the removal of suspended particles in gas by the use of a strong electrostatic field. Reference to the schematic diagram, Figure 1, shows the conventional circuit employed in the Cottrell Process.

Early experimenters proved that direct current is more effective than alternating current for use in electrical precipitation work. Best results are usually secured when the ionizing, or discharge electrode, is of negative polarity. Electrical precitation of the suspended material depends primarily upon the generation in the gas of electrical charges which accumulate on the suspended particles. Simultaneously the gas is made to pass through a strong electrostatic field set up between a grounded surface and a wire, which is electrically insulated from ground and connected to the negative pole of a source of high voltage unidirectional current. (Uni-directional current in this instance is intermittent current always flowing in the same direction.)

The Cottrell Precipitator in its simplest form consists of two sets of electrodes. One set being discharge electrodes of such shape as to facilitate an electrical discharge from their surface, as for instance a wire, while the other set, known as the collecting electrodes, are of such shape to prevent as far as possible any discharge from their surface, as for instance a flat plate or pipe. In the case of detarring precipitators, which is the subject of this paper, these pipe type electrodes are contained within a cylindrical steel shell and so arranged that each pipe has suspended through its central axis a wire known as the discharge electrode. These wires are charged to a sufficiently high potential to permit the formation of a cor-



Schematic diagram of the equipment used in the Cottrell Electrical Precipitator. From left to right: Precipitator, rotary rectifier, transformer, switchboard and supply line.

Figure 1. The conventional circuit employed in the Cottrell Process.

ona discharge. The gases carrying the suspended matter which is to be removed are passed between the discharge and collecting electrodes. During precipitation the particles are charged and driven away from the discharge electrodes and over to the pipe collecting electrodes where they are momentarily deposited. From the inner surface of the pipe the precipitated fluid flows into a lower compartment and then through seals to pumps. The gas itself is unaffected by this treatment and passes from the precipitator free from suspended matter to a degree which is covered in a subsequent paragraph.

Typical Cottrell Installation

The usual type of Cottrell precipitator installation consists of two parts; namely, the precipitator and its corresponding electrical equipment. In the precipitator proper is contained the two sets of electrodes referred to above, also high tension insulators and supporting members together with the required devices for removal of collected material from the electrodes. The electrical equipment, housed in a separate building and commonly called the substation, consists of one or more high tension transformers and one or more mechanical type rectifiers with necessary switchboards and control equipment.

The high voltage current is rectified and transmitted to the precipitator through one leg of the rectifier by means of a high voltage conductor connecting with the precipitator discharge electrodes. The collecting electrodes of the precipitator are connected to ground and form the return part of the circuit back to the rectifier. In a circuit of this type, it can easily be seen that all exposed precipitator parts are perfectly safe. Likewise, exposed high tension leads and equipment within the substation are fully screened and protected. Should it be desired to take further precaution in protecting operators from high voltage parts, safety interlocks can be provided on precipitator doors, valves and electrical switches within the substation. Such devices make it impossible for precipitators to be entered at any time when the unit would be energized.

Because of the location of many plants within heavily populated or built-up areas it has become necessary in certain instances when installing precipitators within such areas to provide electrical equipment with radio interference elimination coils for the suppression of static disturbances set up by the mechanical rectifiers. These coils are employed directly in the high tension circuit and are reported to be giving satisfactory service for the purpose intended.

Application in the Gas Industry

In the gas industry Cottrell precipitators have been extensively applied for the removal of suspended tar fog. Manufactured gas, even though it has passed through scrubbers and coolers, still contains appreciable quantities of tar fog which it is necessary to remove before the gas goes to subsequent equipment. The general type of unit is usually constructed with a cylindrical shell containing a header plate in which are grouped collecting electrode pipes either 6″ or 8″ in diameter by 9′ long. The gas enters at a point below the header plate, flows downward around the pipes and then vertically through the pipes and discharges at the top. As previously explained, a discharge electrode is located in the center of each pipe. Consequently, as the gas flows up through the pipes the tar fog is removed by deposition on the inside surfaces of the pipes from which it flows by gravity and collects in the bottom of the precipitator. Collected tar is removed from the precipitator through a suitable drain and seal. The electrical equipment for energizing the precipitators is identical with that described above under general applications and such electrical equipment is usually located in a separate substation building located a reasonable distance from the precipitator, (see figure 2.)

These precipitators are built in standard size units incorporating various numbers of collecting electrode pipes. The number of pipes contained in a precipitator or the number of precipitator units to be installed is dependent, primarily, upon the volume of gas to be handled and the efficiency or cleanliness of the gas desired. In other words, a number of standard size units can be located in parallel if desired to handle any specified volume. A more detailed description of the application of these precipitators for cleaning various types of gases in the manufactured gas industry is given below.

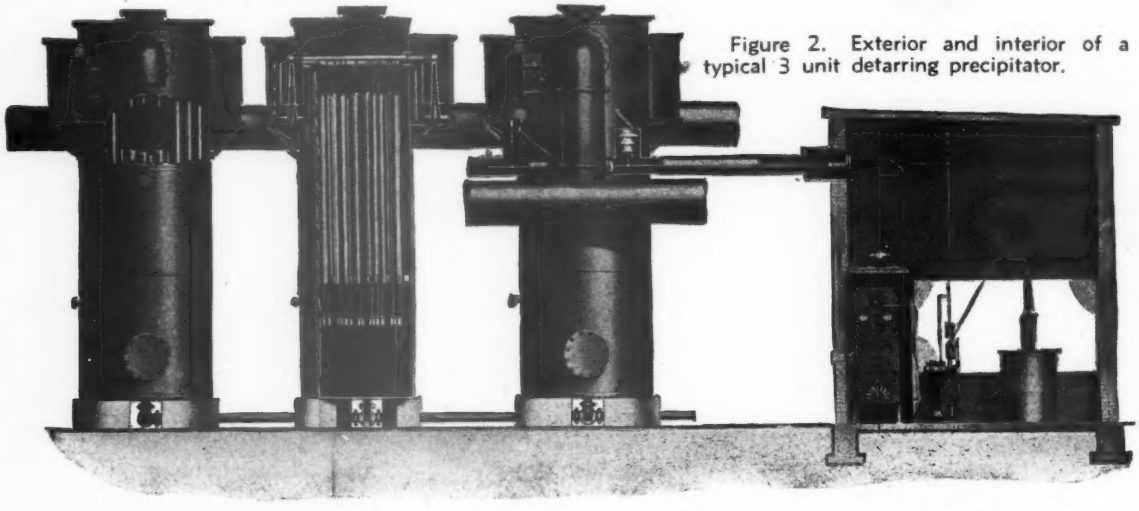


Figure 2. Exterior and interior of a typical 3 unit detarring precipitator.

Blue Gas Cleaning

The object of the application is to recover any fine dust present in the gases coming from the generators in this type of gas manufacture. Inasmuch as there is very little or no tar present in blue gas this means essentially the precipitation of a dry solid. Precipitators for this purpose are located after the primary coolers and handle the gas at a temperature of approximately 90 to 100°F.

In view of the fact that the material removed is a solid and, consequently, does not flow from the electrodes, provisions are incorporated to

flush this material from the electrodes by means of water sprays located in the top of the precipitator. Efficiencies of 95% removal or better have been reported for this type of installation.

Carburetted Water Gas

This is the general type of application. The purpose, is to remove the tar fog from the gas before passing to the purifiers and distribution system. The type of precipitator utilized for this purpose is the pipe type unit as previously described and is usually located after the exhausters immediately before the purifiers. A large number of installations have been made in carburetted water gas plants wherein various types of oils, ranging from the usual gas oil to the heavier Bunker C oil, are used for carburetion. At the point in the system where the precipitator is usually located the temperature of the gas will range from approximately 70 to 120°F. and the pressure from about one to three inches of mercury positive. The material recovered in the precipitator is, in practically all cases, free flowing and, consequently, the collecting electrodes are self-cleaning. These installations are usually made on the basis of 95% tar removal and the results obtained have indicated recoveries substantially higher. To interpret this recovery in terms of actual tar removed from the gas in a precipitator let us assume the inlet concentration of suspended tar to be two grains per cubic foot. A 95% removal of this tar would leave in the precipitator exit gases a quantity representing .10 grains per cubic foot. This means that the gas going to the purifiers contains very little tar fog with resultant reduction in purifier fouling. This also means a reduction in purification expenses and distribution costs if troubles have been experienced due to tar contamination. While we are not presenting any direct figures from any particular plant on the savings in purification expenses, etc., after precipitators have been installed, there are undoubtedly a number of engineers present who have had experience in this connection.

Coke Oven Plants

Precipitators have also been extensively utilized for cleaning by-product coke oven gas. In such type of installation the pipe type unit described above is also utilized and in most cases the collecting electrode pipes are 8″ in diameter by 9′ long. Due to the fact that this is a continuous operation and it is necessary to have precipitators in operation at all times, at least two precipitators are usually incorporated in an installation for a coke oven plant. This provides at least one precipitator for operation if necessary to take a unit off for insulator cleaning or maintenance. These precipitators can be located either before or after the exhausters. Some installations have been made where the precipitators were located immediately following the primary coolers. However, the majority of installations are located after the exhausters and before the ammonia saturators. The temperature and pressure of the gasses at this point are in most cases between 90°F. and 120°F. and similar to the conditions encountered for carburetted water gas. Likewise, the efficiency of removal on this application ranges from 95% to 99%. From a practical point of view, a substantial reduction can be realized in tar contamination of ammonium sulphate, wash oil, also in purification and distribution systems. In recent years with the development of the smaller orifice burners used for the underfiring of coke ovens it has been necessary to obtain a cleaner gas to be used for this purpose. To accomplish this cleaning of the gas utilized for underfiring an additional precipitator has been installed to further clean the gas used for the underfiring of the coke ovens. This precipitator is the same general type as described above and the results obtained on operating installations have indicated that the gas is effectively cleaned for use in these small orifice burners.

Producer Gas Cleaning

In certain cases where coke fired producer gas has been used for mixing with other gases and/or subsequent utilization as fuel in burners it has been found desirable and necessary to remove residual amount of tars and oils present in the gases after they have passed through the ordinary water scrubbers in such types of plants. Cottrell precipitators have been applied for this purpose with very good results. While the pipe type unit is also utilized for this application there are some changes in the details of construction over those described above and provision is also made for flushing any precipitated material from the electrodes. On one particular installation where it was necessary, because of the pitchy character of the tar to add a solvent to remove the tar from the electrodes, a light tar was sprayed into the gas ahead of the precipitator and subsequently precipitated along with the tar in the precipitator, thereby forming a mixture which was free flowing. In other words, on this type of installation it is necessary to provide means for the removal of the precipitated material from the electrodes in the event such material is not free flowing.

Self-Contained Precipitator

In the foregoing discussion we have dealt with the usual type of precipitator installation wherein the electrical equipment for energizing the precipitator is located in a sepa-

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rate substation. One of the more recent developments, however, has been the design of a so-called self-contained unit for gas plants having a capacity of up to about 190,000 cubic feet per hour. This self-contained unit (see Figure 3), consists of a shell divided into separate compartments, one for the precipitator proper one for the insulators and a third for the electrical equipment. The electrical equipment in this case incorporates a tube type rectifier instead of the usual mechanical rectifier used on the average installations. The entire unit is partially assembled at the shops and can be set up at the plant site in a matter of a few days. As a result of this development, precipitators can now be offered that will satisfy the space limitations and economic requirements of the small gas plant.

Maintenance costs are extremely low inasmuch as precipitators are self-cleaning. Only occasional attention is necessary for wiping insulators and inspection of the electrical equipment. In this connection we would point out that insulators are examined and wiped off at intervals of about every three to four weeks. Such labor required for this purpose can usually be supplied from the regular plant personnel.

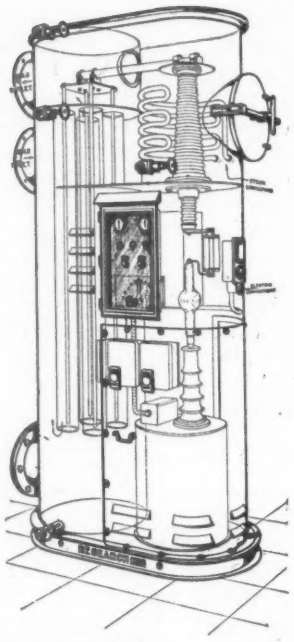

Figure 3. Complete unit for small gas plants with capacities up to 190,000 cubic feet an hour.

Power consumption for these precipitators will range between 5 and 8 kwh per million cubic feet of gas cleaned. This cost when measured in terms of tar recovered, reduction in contamination of purification and distribution systems, will be found to be exceptionally low.

Under usual operating conditions the spare parts that should be carried in stock for making such precipitator repairs that may be required from time to time are but few. Substantially such parts would consist of one or two high tension insulators, rectifier brushes and minor miscellaneous parts representing but a relatively few dollars investment. In the case of the self-contained precipitators, however, we would recommend a spare rectifier tube to be kept available.

Presented at a meeting of New England Gas Association, Operating Division, Boston, January 10th 1945.

Duplex Tubing. An 8 page bulletin issued by Bridgeport Brass Co., Bridgeport, 2, Conn., describes and illustrates various combinations of duplex tubing with outer shell of steel, aluminum, Monel metal or stainless steel. The inner shell may be copper, brass, duronze or cupro-nickel. Close mechanical contact is obtained between the two materials. Methods of installing are illustrated.

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RECENT COURT DECISIONS Affecting Gas Utilities

What Are Lawful Gas Rates?

By
Leo T. Parker
Attorney at Law
Cincinnati, Ohio

IN THE PAST we have in these pages consistently reviewed important gas rate higher court decisions. However, seldom have we had opportunity to impart modern law, based upon higher court decisions, pertaining to reasons why all gas company officials should recognize new law on this subject, likely to reduce law suits. This is so because very infrequently do the higher courts have occasion to render decisions in this classification.

First, it is important to know that the legal interpretation by the higher courts of state laws always determine the validity of city ordinances and regulations relating to gas companies.

Obviously, therefore, the technical interpretation by the higher courts of state laws defining these legal rights is important, when determining the validity of city ordinance and regulations involving sale or distribution of water.

Liability for Overcharge

For the reason that few decisions have been rendered involving overcharges, to special gas consumers, few company officials realize the importance of prearrangements designed to avoid suits of this nature.

For illustration, in Gas Corporation v. Shepperd Laundries Company, Inc., 181 S. W. (2d) 929, reported September, 1944, it was shown that a laundry company sued a gas corporation. The suit was labeled as one for damages for alleged discrimination in rates, at which gas was sold during the period from June, 1934, to October, 1942.

It is important to observe that this suit was based upon discriminations extending over a period of more than eight years. Thus, it is readily apparent why all gas company officials should immediately obtain authentic legal information as to where they stand on this particular subject of law. This is so because usually a relatively large amount of money is involved in suits based upon years of overcharge.

But to continue with the facts of this suit. The laundry company charged that during this period the company supplied gas to it at a rate of 19 cents, 18 cents, 17 cents per thousand cubic feet while, during the same period, gas was supplied to other customers of the company during part of the stated period for 14 cents, 13 cents, and 12 cents, while during another part of the period other consumers were charged 16 cents and 15 cents. The laundry listed the names of the various consumers to whom gas was supplied at these lower rates. In fact in this list were the names of other laundry companies.

The laundry company asked the court to grant it a judgment for the difference between the rates actually paid by it and the rates it would have paid if, during these different periods, it had been supplied the gas at the lower rates alleged to have been charged the other referred-to customers, together wtih interest to the date of the trial on the monthly payments it has so made.

The counsel for the gas company contended that it could not be held liable because the statutes of the state give no support whatever to the suit, since such statutes are a simple statutory enactment of the American common law rule. The counsel proved that no law in the state specified any rate which *must* be charged by gas companies. In fact the state laws "made no requirement as to equality in rates, except in those cases where unequal rates were charged customers in direct competition with others."

Notwithstanding this contention the higher court held the laundry company entitled to a full recovery from the gas company. This court said:

"In such a situation, where there has been no authoritative rate required by law to be enforced, nor even an established or published one, it seems to be the well-settled rule that the lowest rate charged any of such customers becomes the lawful rate for them all. . . . Under the statutes, a public service corporation, cannot discriminate between its customers, similarly situated, in the matter of rates or charges."

Also, see Texas Power and Light Company v. Doering Hotel Company, Tex. Civ. App. 147 S. W. (2d) 897. Here, as to the consumers there involved, there were no fixed classifications as between them and no published rates as applicable to differing classes.

A consumer named Doering sued the company to recover damages which he calculated was the difference between the rate paid by Doering and the lower rate paid by other consumers alleged to be similarly situated.

This court said:

"Doering is therefore entitled to recover damages for such discrimination."

On the other hand, see Kousal v. P. & L. Company, 179 S. W. (2d) 283. In this case the consumer sued the company but failed to prove that he was in the "exact classification" as other consumers who had paid lower rates. In fact in this case the testimony proved that the city had theretofore legally established different rates for the two kinds of service. This court held:

"Therefore, we are constrained to hold that, although the case made by the Kousals (consumer) does show unlawful discrimination and preference by the utility of other similarly situated customers, it does not show that the Kousals were charged more than the rate approved and agreed to by the duly constituted governmental agency, hence that they failed to establish a cause of action for overcharge."

Obviously, the decision rendered by this higher court establishes the law that no consumer may recover either damages, or excess payment, where the testimony proves that businesses or consumers who pay varied rates have been lawfully placed in separate or different classifications. For a complete review of all phases of the law on this subject, see International Mining Company, 230 U.S. 184, Ann. Cas. 1915A, 315; Associated, 228 N.Y. 370; Hilltop Company, 78 S.W. (2d) 718; and Ford v. Valley Gas Company, 174 S. W. (2d) 479.

Federal Power Commission

Considerable discussion has arisen from time to time over the legal effect of an order rendered by the Federal Power Commission in fixing rates for natural gas.

For illustration, in Panhandle Eastern Pipe Line Company v. Federal Power Commission, 143 Fed. (2d) 488, reported July, 1944, the Federal court held that in fixing gas rates the Federal Power Commission is not obliged to adopt the reproduction or replacement costs in determining fair value of assets of a natural gas company and its subsidiaries. Modern courts hold that it may adopt the actual cost or prudent investment formula as a basis.

In this case the question presented the higher court was whether the commission exceeded its power in *not* including in the rate base the present market value of leaseholds owned by company and its subsidiaries. This court held that the commission did not exceed its powers, and said:

"Attention should be directed to the fact that the order complained of is not final and irrevocable. It must be assumed that if actual experience demonstrates that the rates as reduced by the commission are unreasonably low, the commission will allow the petitioners (gas company) to increase their rates. . . . The court cannot concern itself with the commission's choice of formulae or the propriety of the methods employed by it in reaching its conclusion, but only with the consequences of the order made. If the effect of the order is to deny to the utility a return sufficient reasonably to meet its necessities and to enable it to continue to render adequate public service, the order is arbitrary and confiscatory and may be set aside."

Also, see Federal Power Commission v. Natural Gas Pipeline Company, page 586 of 315 U.S. This United States Supreme Court said:

"The Federal Power Commission is not bound 'to the service of any single formula or combination of formulas.'"

In view of these higher court decisions it is quite apparent that the Federal Power Commission may, for rate-making purposes, select any permissible formula or combination of formulas which it considers appropriate under the circumstances.

What Are Depreciations?

Modern higher courts are in accord with the legal rule that depreciation reserves are amounts set apart annually from income for the purpose of replacing the gas company's property when worn out or discarded at the end of its useful life. The figure is calculated by ascertaining the amount which invested in good, safe securities, with the interest added annually, will be reasonably sufficient to replace the worn out plant, when its usefulness is over.

Expressed, from another point of view: "Depreciation is the loss, not restored by current maintenance, which is due to all the factors causing the ultimate retirement of the property.", These factors embrace wear and tear, decay, inadequacy, and obsolescence. By the 'straight line' method of computation the annual depreciation charge is obtained by dividing the estimated service value by the number of years of estimated service life. The method is designed to spread evenly over the service life of the property the loss which is realized when the property is ultimately retired from service. See Hughes v. Illinois, 292 U.S. 151.

With respect to proper and legal income, after depreciation, the Supreme Court of the United States said in Bluefield v. Public Service Commission, 262 U.S. 679:

"A rate of return may be reasonable at one time and become too high or too low by changes affecting opportunities for investment, the money market and business conditions generally."

And in United v. West, 280 U.S. 234, the Supreme Court said:

"What is a fair return within this principle cannot be settled by invoking decisions of this court made years ago, based upon conditions radically different from those which prevail today. The problem is one to be tested ordinarily by present-day conditions."

Therefore, neither calculations, records, nor decisions of yesterday are available or suitable for defending suits of this nature today.

Fair Gas Price Test

A modern higher court has held that the fair "test," when determining whether the price is fair and legal for which gas is sold, is: If the wholesale seller earns a reasonable profit, and the retail seller has no unfair advantage the price at which the gas is sold is legal.

For example, in Espach v. Nassau & Suffolk Lighting Company, 57 N. E. (2d) 835, reported December, 1944, it was shown that certain stockholders of the Nassau and Suffolk Lighting Company sued this company challenging the fairness and adequacy of the price paid by the Long Island Lighting Company for gas sold to it by Nassau and Suffolk Lighting Company which was originally purchased from Queens Borough Gas and Electric Company.

During the trial the testimony proved that the price of the gas was fixed by boards of directors having common members, all selected by the Long Island Lighting Company, but acting in good faith with a desire to promote the interests of each corporation concerned and fairly to both. In each case, too, the price was fixed after consideration of reports by competent engineers retained by the Long Island Lighting Company. The lower court held that the price paid to Nassau for gas it supplied the Long Island Lighting Company was fair market price and that the latter company earned no improper profit.

The stockholders appealed to the higher court contending that the price fixed by the directors was based upon erroneous calculations made by engineers and that if the price had been accurately calculated, the price would have been higher and the profit to Nassau greater. The higher court refused to modify the judgment and decision of the lower court, saying:

"Whatever may have been the method by which the price fixed by the directors was calculated, and whatever errors may have entered into the calculations, it still remains true that Nassau made a substantial profit from the transaction and Long Island Lighting Company gained no unfair advantage. That is the test which must be applied in a case like this, where the common directors acted honestly, seeking to arrive at a fair price, and both corporations benefited by the transaction."

Directors Are Honest

It is well established law that directors of a gas company may be personally liable for losses to stockholders resulting from their negligence or dishonesty. However, no corporation director can be held personally liable where he acts in good faith.

For example, in Chelrob, Inc. v. Barrett, 57 N. E. (2d) 825, reported December, 1944, a suit was filed against a corporation's directors. It

was alleged that they did not act in good faith in determining the rate for sale of gas at a loss between subsidiary corporations with interlocking directorates.

The higher court held that errors of judgment by directors of a gas corporation do not alone suffice to demonstrate the lack of fidelity and illegal gas prices even though the errors are so gross that they demonstrate the unfitness of the directors to manage the corporate affairs.

In this case it was shown that three corporations were operated through interlocking directorates as parts of a single system. This higher court held that the operation of these three corporations, through interlocking directorates, cannot be forbidden if the interests of each corporation are safeguarded by its own board of directors.

In holding the directors not personally liable for losses sustained by the stockholders, the higher court said:

"The directors . . . intended to exercise an unbiased judgment and in good faith believed that the price fixed by them was fair."

Power of Legislature

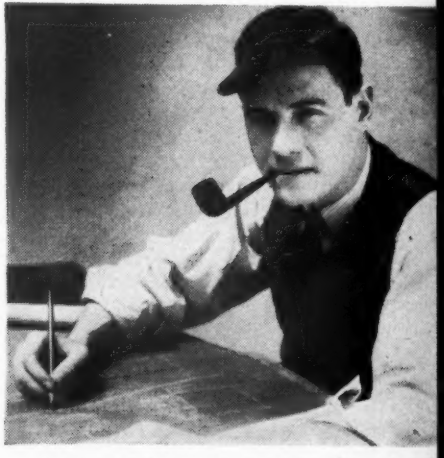
Modern higher courts recognize the fact that a state legislature is free to determine its own economic policy in regard to the fixing of public utility rates. However, its power to assess rates always is circumscribed by constitutional limitations that the rates shall not be confiscatory. Also, that the requirements of procedural due process be followed.

For instance, see Utah Power & Light Company v. Public Service Commission, 152 Pac. (2d) 542, reported November, 1944. This higher court held that although there is no constitutional requirement that public utilities be permitted to earn a fair return on the "fair value" of their property devoted to public use, yet, so far as federal constitutional limitations are concerned, the court will not declare a rate invalid which is not confiscatory, and not unreasonably high. This court, also, said that, under all circumstances, when making rates the Public Service Commission must conform with constitutional provisions and, also, state statutes. If, however, the state laws violate the constitutional provisions the rate as based upon the state laws is invalid.

Thus to save time, effort, and expenses and inconvenience the Public Service Commissions should first determine validity of state rate making laws before rendering its decision and invoking a gas rate order.

FOR TOMORROW'S "DREAM" KITCHENS . . . the range that has always kept a jump *ahead* of women's dreams. The ESTATE HEATROLA RANGE. First to introduce modern, table-top design in a range. Estate influenced the whole trend of kitchen planning. And ESTATE HEATROLA RANGES have continued to set the pace ever since. With new beauty. With new features for extra efficiency and experience. (The Air-Flow Oven, the Grid-All, the Bar-B-Kewer [separate meat oven], to name a few!) Good reason for architects, builders and homemakers to plan tomorrow's kitchen around the new ESTATE HEATROLA RANGE.

I WANT A RANGE that simplifies my work as well as beautifies the kitchen. That's why I'm planning on an Estate Heatrola Range.



I'VE ALWAYS FOUND Estate Heatrol Ranges a long step ahead in design, yea ahead in features. They're in *all* my plan

Estate Heatrola Ranges are made only by THE ESTATE STOVE COMPAN Hamilton, Ohio • First with the finest for over 100 years

This Chart Answers Weight and Volume Questions:

How Many Pounds? How Many Gallons? How Many Cubic Feet?

By
W. F. Schaphorst, M.E.
Newark, N. J.

ON ACCOUNT of the considerable variation in the weight of oils confusion often exists as to the number of pounds of the different kinds of oil in a given container. It is desirable to know the weight of oil because heat values are almost invariably given in B.T.U. per pound.

For that reason, primarily, this chart was developed. It will be found useful for quickly determining the weight of any number of cubic feet or number of gallons of any of the common oils in daily use; high grade or ordinary gasoline, kerosene, diesel engine oil, fuel oil, and lubricating oil. For example, what is the weight of 20 cubic feet of diesel engine oil?

The dotted line drawn across the chart shows how the problem is solved. Connect the 20 in column A with the point in column D corresponding with "diesel engine oil," and the intersection with column C gives the weight as about 1060 pounds. If the quantity of oil is given in gallons, use column B instead of column A.

Inversely, if the number of pounds is known and the kind of oil is known, a line through the known points gives us an intersection in columns A-B which tells the desired volume.

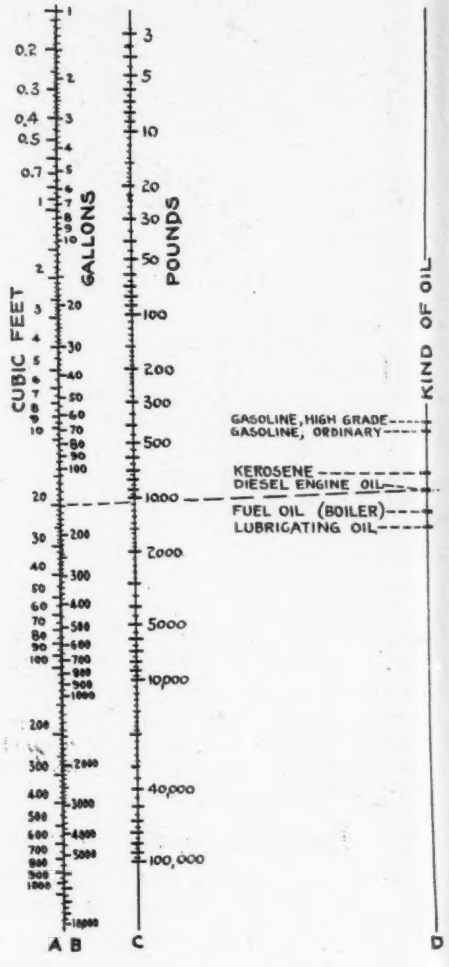
Columns A-B possess further important value as a "conversion scale." Thus for example 20 cu. ft. is equivalent to almost 150 gallons. Or, 1000 cu. ft. is equivalent to about 7500 gallons.

The range of the chart is great enough to take care of most problems. The weight, as will be noted, covers all quantities between 3 pounds and 100,000 pounds. Should quantities be less or more, they, too, can be computed by simply shifting the decimal point. Thus for instance the dotted line drawn across the chart through the 20 cu. ft. can also tell us that 20,000 cu. ft. will weigh 1,060,000 pounds. Merely add three ciphers to the figure in column C because three ciphers were added to the 20. That's all there is to it.

In the event that you prefer to make computations in longhand or on a slide rule, this chart is based on the weights per gallon in the adjoining table.

WEIGHTS PER GALLON

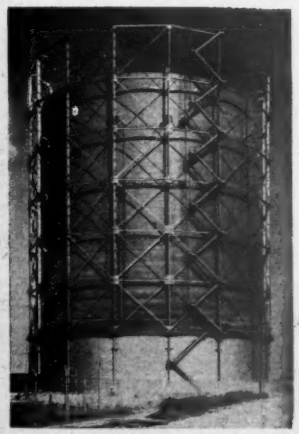
Gasoline, high grade	6.00 lb.
Gasoline, ordinary	6.12 lb.
Kerosene	6.81 lb.
Diesel engine oil	7.09 lb.
Fuel oil	7.50 lb.
Lubricating oil	7.78 lb.



Blake Receives WMC Appointment

Alfred G. Blake, on leave of absence from the sales staff of the Ruud Manufacturing Company of Pittsburgh, Penna., to the War Manpower Commission, has been promoted to Director of Field Operations for the Training Within Industry division of WMC.

He was formerly T. W. I. director of Management Contacts.



SINCE 1851 we have maintained an enviable record in the design fabrication and erection of equipment for the Gas Industry.

Simplicity and sturdiness of holder designs and quality of workmanship are outstanding features of our service to the industry.

Our leadership in this field will be maintained when peacetime permits still greater expansion.

The products and services we offer include much of the heavy equipment entering into gas making, storage, transmission and distribution.

Ask us about our Gas Holder Inspection Service.

THE STACEY MANUFACTURING CO.

Engineers · Fabricators · Constructors

• Gas Holders • Gas Plant Equipment • Steel Plate Construction •

CINCINNATI — OHIO

Of Course! You Expect Big Things from "CLEVELAND" in the Post-War Trencher Picture

Throughout the nation, trenching machine users have come to associate the name "CLEVELAND" with trenching equipment pioneering and progress. Over the years, its record of achievement is indisputable. Post-War planning comes natural to us because "CLEVELAND" *has never stopped* planning.

It's smart to do *your* post-war planning by placing your order for "CLEVELANDS" now—the machines that are built to lick the tough jobs and the even tougher competition that is coming.

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20100 ST. CLAIR AVE. "Pioneer of the Small Trencher" CLEVELAND, OHIO
"CLEVELANDS" Save More . . . Because they Do More

Book Review

Basics of Supervision:—By H. W. Heinrich. Safety Engineering Division of Alfred M. Best Company, Inc., 75 Fulton Street, New York 7, New York, 1944. XV, + 180 pages. 17 illustrations. $3.00.

In this book the author has taken apart the vastly complex subject of supervision, identified its separate basic factors, and arranged in orderly fashion the chain of elements connecting foremanship with safe and efficient production.

The practicing supervisor or production executive needs but to reflect upon his own individual training to agree with the author who states in his foreword "Foremen, upon whom the nation depends to carry on one of its most important industrial functions, are largely untrained in the art of supervision. Dependence is placed on their individual experience and ability to practice a most difficult art, namely, that of controlling the safe and proper performance of persons, the safe and proper care, maintenance and operation of equipment, and the functioning of the processes, procedures and services of which they are in charge."

The text of "Basics of Supervision" is constructed about the tested pedagogical "Rule of Four." Under each of the four cardinal essentials of supervision, (attitudes, abilities, knowledge and action) is a further breakdown of four component fundamentals. The resulting entire chain of sixteen basic factors and their relation to one another are explained one by one in simple, concise, narrative style.

SUPERIOR GAS METERS

For Sound Values and Continuous Operating Economy

Meters for Domestic and Industrial Use. All Sizes 5B to 60C.
Wet Test and Demonstration Meters — Diaphragms —
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Write for details and quotations

SUPERIOR METER COMPANY, INC.
167-41st Street ***Brooklyn, N. Y.***

All-Steel Welded Casing Encloses Hub Sleeve to Meet Increase in Pressure

The steel casing after being installed. Welder and foreman on the job are plugging the holes in the casing used to introduce the hot pitch filling.

Photo courtesy Westchester Lighting Company

THE 20 and 16 inch cast iron gas main of the Westchester Lighting Co. between Pelham and Rye, N. Y., part of the Consolidated Edison System is undergoing considerable overhauling and reinforcing.

In order to enable the main to carry an increase in pressure, bell joints have been clamped and the anchoring of all bends, dripheads and dead ends is being completed.

In addition, nineteen cast iron split hub sleeves must be replaced with steel welded tees, since the split hubs would not permit the installation of clamps. The work involved in removing each hub sleeve originally would have included the breaking of concrete pavement to the extent of approximately 25 feet by 4½ feet together with the necessary excavation; tapping of the main; throttling of pressure; cutting; bypassing and removal and installation of fittings. Obviously such extensive operations could not have been performed during the winter or peak season, but would have had to be held over until spring.

To avoid this delay, and also to reduce the cost of the project, an idea was evolved to enclose the old hub sleeve, while in place, with some sort of casing. The department developed an all-steel welded casing with ends equipped for leak clamps. The casing was cut in half longitudinally and rewelded together after the two halves had been fitted over a hub sleeve in the field. The area between the steel casing and the enclosed hub sleeve was then filled with hot pitch to expel the air and prevent future deterioration of materials. The installation of this casing over the hub sleeve was made in an opening only 5 by 5 feet, and the cost of the fabrication and installation, including repaving, amounted to about one fourth of the cost of the former method.

This experiment with the first casing having proved a success, work is progressing rapidly on the enclosing of the other eighteen hub sleeves, and when the job is completed, the main will be capable of carrying the desired increase in pressure whenever needed.

Chemical Use of Gas Negligible

That present and future requirements of petroleum and natural gas for chemical use are negligible, was stated in a report submitted at the winter quarterly meeting of the Interstate Oil Compact Commission. The Compact's Regulatory Practices Committee, composed of regulatory officials of the producing States, filed a report showing the consumption of natural gas for 1943 as follows: Field consumption 20.8%; domestic use 14.6%; commercial use 5.8%; carbon black manufacture 8.7%; petroleum refineries 7.4%; electric plants 8.3%; cement industry 1.4%; other industrial 33%.

The report showed that for 1944 the chemical industry consumed less than 1% by weight of all petroleum and natural gas produced for the year, and that the expanded use of gas as a raw material for chemical products will not, in the immediate future, consume an appreciable portion of natural gas production.

1945 MODEL!

Bob White

ELECTRONIC BOX LOCATER

Rapidly locates all metal utility service boxes

Curb Boxes Street Boxes
Meter Boxes Drip Boxes
Manhole Lids, etc.

This light weight type gives signals (even in the dark) *as fast as you can walk.*

It even locates demagnetized boxes which dipping needles cannot find.

In this new model, the amplifier case is mounted on the handle of the search coil to give more depth penetration.

Dry cell batteries are in a separate case with leather shoulder strap.

Write for bulletin or phone for data.

Manufactured by

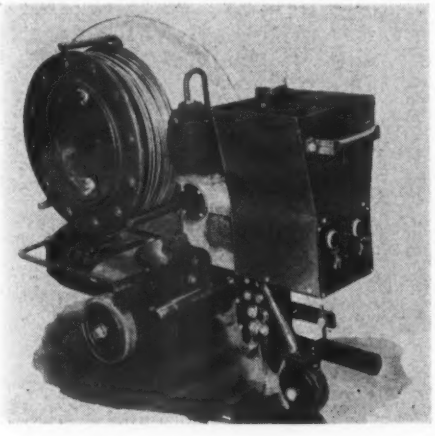
S. F. FERGUSON
11 HILL STREET, NEWARK 2, N. J.

New Equipment and Appliances

New Metallic Arc Welding Process

A new type of automatic welding known as "Lincolnweld" (Trade Mark Registered) a process which is simpler, faster and more economical in operation than any known existing process of automatic arc welding has been announced by The Lincoln Electric Company, Cleveland, Ohio.

This development to meet the need for a more foolproof and easier applied process, has established its practicability over a period of several years during which many units have been highly successful in welding a variety of products, among which are machinery bases and beds, motor and generator frames, ventilating fans, tanks and pressure vessels of all kinds.



"Lincolnweld" unit of the motor driven tractor type.

It has been successfully used in welding all types of joints including butt, lap, tee, and fillet as well as corner.

The process is designed for use with direct current, utilizing a bare metallic electrode which is fed through a granular flux deposited on the joint to be welded. Sufficient flux is applied to completely blanket the arc and the molten metal; the unfused flux is then reclaimed for further use.

Direct current offers many important advantages over alternating current; such as a more simplified and positive control; ability to weld non-ferrous materials; and better control of electrode melting rate through the option of either straight or reverse polarity.

Extremely high current densities are used. For example, ⅛-inch diameter electrode may carry as much as 650 amperes. This produces greater penetration and permits smaller cross section of weld metal with resulting saving in cost and reduced warpage and distortion.

The welding head is normally used in conjunction with a specially built automatic welding set of 1200 ampere capacity. The current rheostat in the automatic control box permits a current range of 300 to 1200 amperes. The unit has two exciters, one for the automatic head control and one for the welder field excitation. The welder control box has provisions for easy and quick wiring of the automatic.

The standard head is changed from butt to fillet welding in a matter of only a few minutes. In making fillet welds the lower wire guide and flux tube are changed from straight to curved, thus permitting the head and wire reel to be left in its normal position. The wire is fed in at 40 degrees from horizontal which gives the maximum effective throat for horizontal fillet welds.

Stock Handling Cart

To save steps and material handling in stockrooms, toolrooms, shipping departments and numerous other operations, Lyon Metal Products, Inc., Aurora, Ill., recommends its stock handling cart as an important aid for expediting operations, and simplifying the handling of materials.

Lyon Stock Cart

The cart shown, model No. 2000-11, is 30" long, 16" wide and 32" high—overall. The price of this unit is reasonable and extra center tray (not shown in photo), is available. The desk accessory is 16" wide and 14" deep with a 5 deg. slope.

This cart is finished in green baked enamel and is shipped set up.

Process Timing Control

The Taylor Process Timing Mechanism for Fulscope Temperature or Pressure Controllers, is built into either the single duty Fulscope Recording Temperature or Pressure Controller and functions as follows:

Taylor Timing Control

The process is started manually by adjusting the instrument for the desired time period. Timing begins, not immediately, but when the apparatus reaches the desired control point, no matter how long or short a time that may take. At the end of the timed period the Process Timing Mechanism automatically ends the process.

Taylor Instrument Companies, Rochester, New York, will furnish details upon request.

New Ideal Auto Charger

A new Charger for recharging "Ideal" Flashlight Storage Batteries from an automobile battery is announced by the Ideal Commutator Dresser Company, 1404 Park Ave., Sycamore, Illinois.

Battery Charger

The Charger connects directly to the "live" side of the ignition system. It may be mounted either on the dashboard or on the side panel just inside the door. A small pilot lamp on the Charger indicates when the flashlight battery is charging. It may be charged, even though the motor is not running.

A GOOD IDEA!

It is a good idea to take soapy water and a brush and thoroughly wash the pipe socket, spigot end and the gasket before assembling a mechanical joint. Then, line up the pipe, slip the gasket into the socket, insert the bolts, tighten them alternately with an ordinary ratchet wrench, and that's all you have to do to assemble the simplest, tightest pipe joint a gas distribution engineer could ask for. Top efficiency quickly attained with untrained labor. Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, Peoples Gas Building, Chicago 3.

CAST IRON MECHANICAL JOINT PIPE

No. 2 in a series showing the steps in assembling a mechanical joint.

News of the Gas Industry

Equitable Gas Co. Appointments

D. P. Hartson, Vice Pres. and General Mgr. of Equitable Gas Co. announced the following appointments which were effective January 1st.

F. B. Jones as manager of sales and market research of Equitable Gas Company and the Pittsburgh and West Virginia Gas Co. He entered the employ of the Companies in 1925, is active in A.G.A. work and was general sales manager until his present appointment.

Raymond Little has been appointed general sales manager of the Equitable Gas Company and Pittsburgh and West Virginia Gas Company. Mr. Little entered the service of the Gas Companies in 1926 following his graduation from the University of Pittsburgh. He was manager of commercial sales until his present appointment.

Gas Institute Personnel

Morris Fisher and Dr. Sidney Katz, have been added to the technical staff of the Institute of Gas Technology, it has been announced by John I. Yellott, director.

Fisher, a specialist in micromeritics, the science of small particles, has been assigned to work on an improved method of producing carbon black. He was a chemist for eight years with the U. S. Bureau of Mines at Pittsburgh, and during the last year has done research on a special project at Columbia university, New York City.

Dr. Katz will work in the field of gas chemistry, particularly in the physical chemistry of fundamental gasification reactions. His first assignment is a special project for the National Research council. Formerly research chemist for Goldsmith Brothers, Chicago, and for the Pfanstiehl Chemical company, Waukegan, Dr. Katz has served for two years as lecturer in mathematics at Illinois Institute of Technology.

Benjamin Miller has resigned as technical assistant to the director of the Institute of Gas Technology, effective April 30, 1945, to engage in independent consulting practice in New York. He will continue to serve the institute as a consultant.

Gas Service Restored in Florence, Italy

The first commercial gas service in liberated Italy is now operating in Florence as the result of months of work by engineers of the Societe Idrocarburi Nazionali in cooperation with AMG, 5th Army.

Over a thousand cubic meters of Matano, a purified natural gas was piped into kitchens of Florence hospitals when the system reopened.

Last operated in July, the 50-kilometer long pipe line to natural gas fields north of Florence, was broken in 25 places by the Germans and two mine fields were laid around key points in the line.

The new gas service, as it is increased, is expected to relieve pressure on the "critical coal and wood supply" according to the 5th Army release.

—*Stars and Stripes.*

L. P. Gas for City Gas Plants

City gas plants are estimated to have consumed 46,000,000 gal. of LPG in 1944, an increase of 22.6 per cent over 1943, according to *Oil and Gas Journal.* This increase was greater than the 19.6 per cent increase in 1943 largely because of the use of LPG for coal enrichment and underfiring of coke ovens in several large cities.

One city gas plant stored LPG at low pressure in undiluted form. No high-pressure liquid storage tanks were available so the company allocated a 3,000,000 cu. ft. gas holder to butane and propane storage. As tank cars were received the butane or propane was vaporized in a conventional heat exchanger and undiluted vapor pumped into the holder at 6-in. water column pressure. The gas holder acted as a standby from which gas was withdrawn at peak-load periods, diluted and added to the send-out stream. By storing 3,200 B.t.u. butane vapor instead of 530 B.t.u. gas the capacity of the holder was expanded in effect from 3,000,000 to 18,000,00 cu. ft. of 530 B.t.u. gas. At present the holder is being used for the storage of undiluted propane vapor. This is because butane is unavailable now in adequate quantities because of war demands for aviation gasoline and synthetic-rubber components.

American By-Product Coke Institute is Formed

The American By-Product Coke Institute has been formed under the General Not For Profit Corporation Act of Illinois. Officers of the Institute are as follows:

President: Leigh Willard, President Interlake Iron Corporation, Union Commerce Bldg., Cleveland.

Vice President: William H. Earle, President Philadelphia Coke Company, 4501 Richmond Street, Philadelphia,.

Treasurer: P. H. Neal, Manager Coke & By-Product Sales, Alabama By-Products Corp., First National Building, Birmingham, Ala.

Secretary: Alfred Hirsh, Vice President, The Laclede Gas Light Company, 1017 Olive Street, St. Louis.

Headquarters will be established in Washington, D. C., and Mr. Samuel Weiss, who has reecntly resigned as Chief of Fuel Section, Steel Division, War Production Board and Chief of Coke Distribution of the Solid Fuels Administration for War, will be the Executive Secretary.

AT A REGIONAL MEETING FOR SELECTION OF SALESMEN

Seventy Pacific Northwest gas men, representing seven utilities, attended the eighth regional presentation of the program for the selection and training of domestic gas salesmen sponsored by the American Gas Association in cooperation with Servel, Inc. The meeting was held in Portland under auspices of the Pacific Coast Gas Association. R. G. Barnett (second from right), an A.G.A. director and Portland Gas & Coke Company executive, is shown looking over plans for the meeting. Others (from left) are: R. J. Caniff of Servel; R. E. Williams, chairman of the A.G.A. program; and Dr. Robert McMurry, Servel sales training consultant.

Newspaper Mats for New Freedom Kitchen

The Geo. D. Roper Corporation, Rockford, Illinois, has prepared a set of newspaper ads featuring the New Freedom Gas Kitchen. Tying in with the gas industry's program these ads will help condition public thinking as to what to expect in gas appliances and gas kitchens to come.

Each of the six ads in the series illustrates a modern kitchen built around the three main centers of activity—the storage center, the sink and dishwashing center, the range center.

Four ads are 3 col. x 10" and two are 2 col. x 10". Complete newspaper mats are available free of charge.

Dresser Industries Take Over Kobe Company

Stockholders of Kobe, Inc., Huntington Park, California, approved at a special meeting the transfer of the assets and business of the company to Dresser Industries, Inc., Cleveland, Ohio, for 34,594 total shares of Dresser stock. Dresser directors had previously agreed to this transaction on December 8.

With the addition of Kobe, the Dresser companies on the West Coast will total three.

Kobe, Inc., is a manufacturer of hydraulic oilwell pumping systems.

Portland (Ore.) Gas & Coke Co. Reached New Peak in 1944

Customers and the gas they used reached new high marks during 1944, reports Portland (Ore.) Gas & Coke Company.

Customer total climbed to 104,452 for a 5 per cent increase over 1943, while gas sendout scored a 5.5 per cent increase. In a comparison between 1944 and 1939, the customer increase was 21.5 per cent and the gas sendout increase was 74.4 per cent.

An all-time high monthly sendout was recorded in December with 826,374 cubic feet. The previous high had been January of 1943 with 821,761,000 cubic feet.

The company's Gasco briquets also set a new high mark with 94,562 tons delivered during 1944, a gain of 2962 tons over the previous record year, 1942.

Much of the company's output of gas and by-products goes to the war effort, either directly or indirectly.

Fred M. Kimball has been appointed sales promotion manager of the company, according to an announcement by R. G. Barnett, vice president and general manager.

Until recently Kimball was chief of the allocation section of the manufactured gas division, office of war utilities, WPB, in Washington, D. C. Before joining that agency two and a half years ago he was commercial manager of the Missouri Public Service Corporation.

Kimball's major responsibilities in his new position will be the direction and analysis of postwar marketing surveys and studies which the Portland utility is conducting in the commercial, industrial and residential fields.

1945 Southwestern Gas Measurement Short Course Given Official Approval

The War Committee on Conventions of the Office of Defense Transportation has reviewed the past activities of the Southwestern Gas Measurement Short Course and has ruled that it does not come within the scope of the government restrictions on conventions. The ruling was made because the short course can in no way be considered a convention, but is a regularly scheduled educational project of the College of Engineering, University of Oklahoma.

Because of travel difficulties and other war time conditions, the General Committee of the short course cancelled the 1943 school and did not plan to hold another for the duration of the war. The omission of the course during that year was felt keenly by those engaged in gas measurement and related work. This was especially true of new employees who did not have an opportunity to receive the specialized training offered during the course. Older employees also missed the schooling opportunities presented through this educational project. During 1944 demand for the course became so great that the committee gave its approval and the 19th annual Southwestern Gas Measurement Short Course was held in June of that year. The final registration figure was 524 with those in attendance ranging from metermen to company executives. A number of officers of the armed forces who are charged with the responsibility of gas measurement and distribution registered for the course. Since both the demand and necessity for a short course in 1945 is equally as great, the committee has set April 17, 18, and 19, as the dates for this year's school.

GENERAL COMMITTEE SOUTHWESTERN GAS MEASUREMENT SHORT COURSE

STANDING—Left to Right: George E. Greiner, Phillips Petroleum Company, Bartlesville, Oklahoma; W. R. McLaughlin, Pittsburgh Equitable Meter Company, Dallas; E. L. Stark, The Foxboro Company, Dallas; E. C. McAninch, Oklahoma Natural Gas Company, Ardmore, Oklahoma; James L. Griffin, Northern Natural Gas Company, Omaha, Nebraska; C. E. Terrell, Southern Natural Gas Company, Birmingham, Alabama; J. H. Satterwhite, American Meter Company, Tulsa; B. F. Worley, United Gas Corporation, Houston; Gilbert Estill, Oklahoma Natural Gas Company, Tulsa.

SITTING—Left to Right: W. H. Woods, Gulf Oil Corporation, Houston; Earl Kightlinger, Arkansas Louisiana Gas Company, Shreveport, Louisiana; C. A. Gibson, Cities Service Gas Company, Bartlesville; R. M. Scofield, Lone Star Gas Company, Dallas; W. H. Carson, Dean, College of Engineering, University of Oklahoma, Norman, Oklahoma; Miss Kate A. Niblack, Oklahoma Utilities Association, Oklahoma City. Lloyd L. Jordan, Arkansas Oil and Gas Commission, Eldorado, Arkansas, attended the meeting, but was not present when picture was taken.

A. F. Scharer to Direct Servel International Division

Servel Inc. announces the reorganization of its export activities by the formulation of the International Division, according to Geo. S. Jones, Jr., vice-president in charge of sales.

A. F. Scharer

The new division will be under the direction of A. F. Scharer who has been in charge of Servel's export business since 1929. Headquarters of the Division will be at 51 East 42nd Street, New York 17, New York. It will promote the distribution of a complete line of refrigeration fixtures of allied manufacturers for sale through its world-wide distributing organization, in addition to its own products.

G. D. Roper Corporation Honors Fifty Years of Service

In recognition of more than a half-century of continuous faithful service at the Geo. D. Roper Corporation, Richard "Dick" DeLong was honored at an informal ceremony in the office of the Roper president, Stanley H. Hobson.

Mr. DeLong was presented with a diamond studded pin and Award of Merit paying tribute to his loyalty to the company.

Since his first employment in 1894 he has worked in almost every department of the Roper Corporation, including pattern shop, saw, sheet metal, shipping and repair departments. His longest job was in the range assembly department. As foreman of the "line" he was George D. Roper's right hand man.

Dick is proud of his association with the company, and of his enviable record at Roper. For Dick his 50 years are only a beginning. Says he, "I have 24 years to go before I reach 100, and I'm going to keep on working!"

Dick DeLong receiving Award of Merit from Roper president Stanley H. Hobson. Others present were plant superintendent, Lionel R. Jensen; executive vice president, Floyd K. Lawson; vice presidents E. Carl Sorby and Otto H. Olson; secretary, John P. Curtin and personnel director, Willard Otto.

Window Display Effective in Public Relations

Window Display on Meters by Michigan Consolidated Gas Co.

Michigan Consolidated Gas Company, Detroit, as part of its farsighted confidence-building program, recently developed two effective displays for their own windows, dramatizing the accuracy of modern gas metering—one of which is shown above.

The meters displayed are American Meter Company instruments, and the photograph is an enlargement of an illustration reproduced in that company's Tinned Steelcase Meter Catalog.

At the right of the photograph is a meter with a glass case for demonstration of meter operation. A small motor behind the screen operates the meter. This was fitted up in Michigan Consolidated's own shop for use primarily in their Commercial Training Department.

Servel Inc. Adds to Air Conditioning and Sales Staffs

Carl Schroeder has joined the Air Conditioning Division of Servel Inc., Evansville, Ind. Previously Mr. Schroeder was associated in the Research Division of Servel's Engineering Department.

Carl Schroeder Howard V. Nichol

Before coming with Servel he was Refrigeration Engineer with Sunbeam Electric Manufacturing Company of Evansville. He is a graduate of the University of Chicago.

Howard V. Nichol, has recently been added to the staff of the Advertising and Sales Promotion Department. Before coming to Evansville, Mr. Nichol was a free lance artist in Indianapolis, and he studied at the John Herron Art Institute.

New Engine Discovery Announced by Cooper-Bessemer

New Gas Engine Design Cuts Fuel Consumption 25 Percent

A new discovery in the Diesel engine field, which will enable the engine operator to use either gas or oil as fuel without any electrical sparking device, and which will cut fuel consumption of gas engines by from 20 to 25 percent, has been announced by Ralph L. Boyer, chief engineer, of The Cooper-Bessemer Corporation, Mt. Vernon, O.

Mr. Boyer said that the new discovery is the result of experimentation which began in 1928. Recently efforts have been rewarded by the successful operation of a natural gas engine on the Diesel principle. This enables the unit to operate on a wide variety of fuels including fuel oil, natural gas, manufactured and coke oven gases, sewage gas, and refinery by-products.

The conversion from liquid to gas fuel is accomplished by the closing of one valve and the opening of another with the engine operating continuously at full load. Although conversion from one fuel to another has been possible in the past, it has always been necessary to shut down and exchange major or minor parts of the engine.

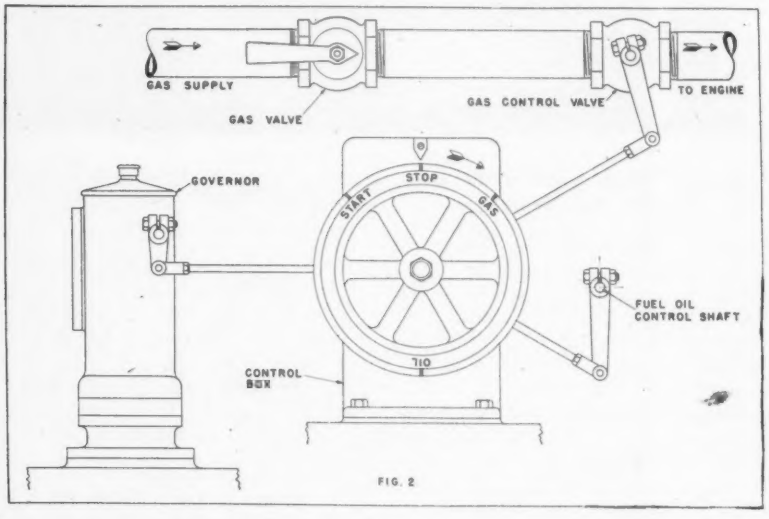
The new principle will enable the engine to have the same fuel economy regardless of the type of fuel used. It raises the normal 25 percent thermo-efficiency of the gas engine to the 35 percent thermo-efficiency common in Diesel oil engines.

Several times since 1928, engineers in the Diesel field thought they had the answer to the multi-fuel conversion problem but in the past it has been thought necessary to inject the gas under high pressure of from 1200 to 1500 pounds. This involved complications which overcame the advantages obtained. The new Cooper-Bessemer development makes possible the use of gas at normal pressure and the change from one fuel to another without the necessity of a shut-down.

The significance of the new discovery is particularly impressive when one of our modern transcontinental pipe lines is considered. Many of these pipe lines have from 100,000 to 150,000 horsepower of gas engines installed along their length which drive the compressors or pumps that deliver the fuel to the markets of the East. The total fuel used by these engines for 150,000 horsepower would amount to 36,000,000 cubic feet of gas per day, which is about one-third of a single day's total consumption of a city with a population of a million.

When operating as gas engines, these new gas Diesels would save from 5,000,000 to 6,000,000 cubic feet of gas for domestic and industrial consumption per day. If these engines are converted to oil fuel—and they could be in a moment's notice, to any or all oil fuels—the total fuel consumption of 36,000,000 cubic feet of gas could be made available for consumer use.

In addition to the convertibility feature and the possible fuel saving, the new discovery in Diesel operation will mean the elimination of one of the greatest fire and explosion hazards in the gasoline refining industry because there will be no necessity for using any ignition or sparking device.



This diagram shows the method by which the controls are utilized to change from use of oil to gas, or vice versa, or even to maintain a mixture of the two where there might be insufficient gas to pull a load. It is possible to arrange it so that the engine automatically goes from one to the other as the gas availability fluctuates. Hundreds of installations at places where the future of the fuel supply is uncertain could solve their operating problem with this new method of control.

Colonel McClenahan Home on Leave

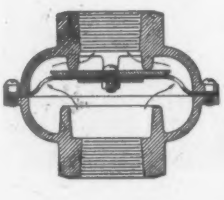
Col. R. W. McClenahan has returned to this country on leave after two years and eight months of continuous foreign service in some of the most active theatres of the war.

Manager of American Meter Company's Philadelphia manufacturing and sales division, Colonel McClenahan was given leave of absence by American Meter in March, 1942, entering the service with the rank of Major.

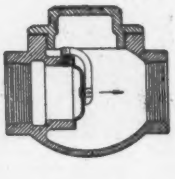
Col. W. R. McClenahan

He was awarded the Legion of Merit last September while serving as Intelligence Officer attached to the Ninth Air Force in the middle east, and more recently King George of England conferred upon him the Order of the British Empire for distinguished service in cementing relations between the Allied Nations.

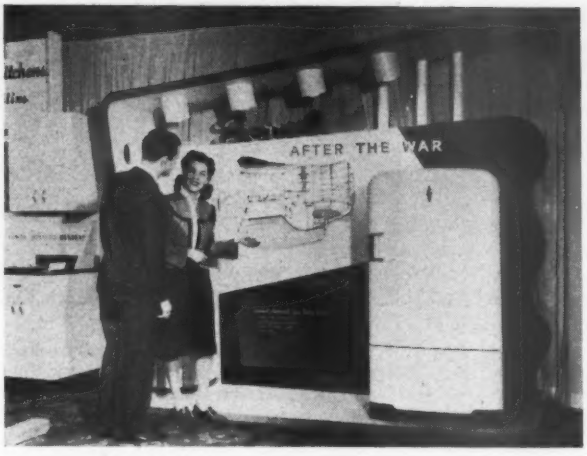
Pressure Controls for Gas and Air



HORIZONTAL
DIAPHRAGM
CHECK VALVES
DISC
VERTICAL



NORWALK VALVE COMPANY
85 Spring St. South Norwalk, Conn.



A Servel display at the National Home Builders' Show recently held at the Sherman Hotel in Chicago. The exhibit featured the Servel Refrigerator and the Servel Automatic Gas Water Heater. A modern gas kitchen in diagrams provided the background.

Tomorrow's Kitchen

Stimulating the desire on the part of the public for a well-planned kitchen, is an article by E. Carl Sorby, V.P. of George D. Roper Corporation in the January issue of "Red Barrel" a house organ issued and widely distributed to the public by the Coca-Cola Company.

In this article on Tomorrow's Kitchen, Mr. Sorby stresses the need for proper ventilation for the removal of cooking odors and illustrates three modern types of assembly of the units.

"A well-planned after-the-war kitchen," he says, "may well have its own individual space heating, individually controlled roaster, dishwasher or pressure cooker and many other conveniences. These can be placed in the American Kitchen within reach of the average pocketbook."

Wilson Appointment with General Controls

General Controls Company, Glendale, California, announces the appointment of Joseph W. Wilson as Manager of the Glendale Branch Office.

After graduating from Holland's Domestic Heating Engineering and Combustion Engineering School, he served as heating engineer for the Holland Furnace Company for 15 years and as manager of several Holland branches. For a time he was Sales Engineer and later Production Manager of the Kinney Aluminum Company. As Manager of General Controls' local branch, he will devote his entire time to serving users of automatic controls in the heating, refrigeration, aircraft and industrial fields throughout the Southern California, Arizona and Southern New Mexico area.

"Payneheat"

Change of name of the 30-year-old Payne Furnace & Supply Co., Inc., of Los Angeles is announced in connection with the recent acquisition of assets by Dresser Industries, Inc., in a joint statement issued by H. N. Mallon, president of Dresser and E. L. Payne, president of the Payne Company.

"Payneheat" will operate as a separate unit of the Dresser Industries, continuing to manufacture the well-known, long-established Payne models; and no changes in management or general policies are anticipated.

For the past three years, Payne has concentrated on essential war production, but when men and materials become available, the Company plans to expand its line of products and services.

These include gravity warm air systems, forced warm air units for winter air-conditioning and summer ventilation, gas floor and duplex furnaces, gas vent pipe and other accessories. Payne furnaces operate on natural, manufactured and liquefied petroleum gases, and are used for both commercial and domestic heating.

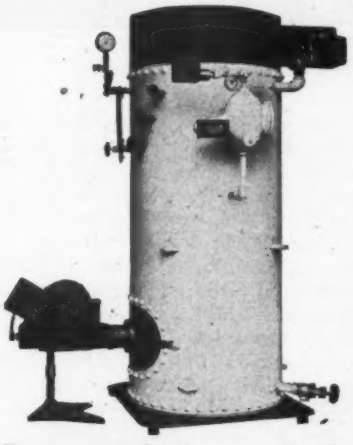
Florida Power Corp. Disposes of Some Florida Properties

Gas systems belonging to the Florida Power Corp., in Orlando, Winter Park, Maitland, Orange City, DeLand, and Sanford, Fla., have been sold to the Florida Utilities Corp., at Orlando.

F. Monroe Alleman, vice president of the Florida Utilities Corp. instrumental in financial arrangements, stated that plans for the corporate structure will include "substantial local interests." He added that funds to allow adequate future expansion and improvements commensurate to the growth of the territory are included in the financing plans of the new organization.

H. R. Cloud, general manager of the gas division for the Florida Power Corp., at Orlando, will be president and a stockholder in the newly-formed gas utilities company.

LATTNER
GAS — OIL BOILER
3 HP to 35 HP.

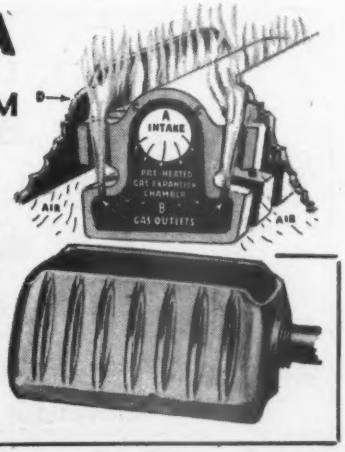


Burns natural gas or regular furnace oils with equal efficiency using same burner.

P. M. Lattner Mfg. Company
Cedar Rapids, Iowa

COLUMBIA
LITTLE GEM
GAS BURNER

A small unit which may be used singly or in series. Each unit 6½ in. long x 4 in. wide. Wide application of domestic and commercial uses. May be used in round or square steam or hot water boilers, warm air furnaces, Arcola type heaters and circulating heaters. Used commercially for heating tanks, boilers, ranges, ovens, etc. Natural, manufactured, or mixed gas. Complete combustion without pre-mixing. Write for circular.



COLUMBIA BURNER CO.
729 Ewing Street
Toledo 7, Ohio

CLEVELAND

"A" TYPE METERS
"B" TYPE METERS
DIAPHRAGMS

Cleveland Gas Meter Co.
ESTABLISHED 1875
2009 Rockwell Ave., Cleveland 14, O. Phone CHerry 2351

Carroll B. Mershon Receives Appointment

Oscar R. Olsen, President of the Pennsylvania Industrial Engineers, which specializes in gas burning equipment and all types of metallurgical furnaces, has announced that Carroll B. Mershon has been appointed Assistant to the President of the company, effective, February 15, 1945. The offices of the company are in the Fulton Building, Pittsburgh, Pennsylvania.

Carroll B. Mershon

Mr. Mershon was graduated from Iowa State College in 1919 with a degree of Bachelor of Science in Chemical Engineering. He has been with the Manufacturers Light and Heat Company at Pittsburgh since 1930, first as Industrial Engineer, and since January 1940 as Manager of Industrial Sales. Other previous connections included the Buffalo Foundry & Machine Company, Buffalo, New York, Wood Brothers Company, Des Moines, Iowa, the Des Moines Water Company, and Northern Indiana Public Service Company at Hammond, Indiana.

Technicolor Film on Arc Welding

A new Technicolor sound motion picture titled "Magic Wand of Industry—Arc Welding," just released by The Lincoln Electric Company, Cleveland, Ohio, portrays the dramatic progress of arc welding from its beginnings to its present vital wartime role.

Produced at the request of the U. S. Bureau of Mines which is releasing the picture under the title "A Story of Arc Welding," this 25-minute presentation, filmed under the technical direction of Lincoln welding engineers, was staged and photographed in practically every major industry.

Primarily educational, the film graphically presents the fundamentals of arc welding, the electrical circuit, and the types of welded joints. The true action inside the arc is also revealed for the first time in actual photography and animation, showing the penetrating "arc force" which assures high strength and good fusion of all metals. To obtain the photographs of the arc, it was necessary to use a battery of arc lights using power equivalent to 4500 automobile headlights all focused on an area of one square foot.

The film is available in 16 mm. and 35 mm. prints to business groups, technical societies, schools and colleges and industrial plants at no charge except transportation. A short version of "Magic Wand of Industry—Arc Welding" is scheduled for theatrical showings throughout the country.

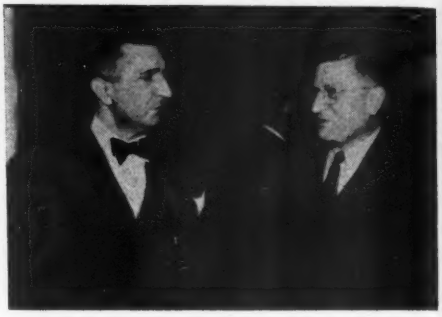
The Technicolor release may be obtained on request from The Lincoln Electric Company, 12818 Coit Road, Cleveland 1, Ohio, or from the U. S. Bureau of Mines, Experimental Station, 4800 Forbes Street, Pittsburgh, Penna.

J. K. Knighton on Air Conditioning

John K. Knighton, sales manager of the Air Conditioning Division of Servel Inc., addressed a recent meeting of the Minneapolis chapter of the American Society of Heating and Ventilating Engineers on what complete year 'round air conditioning will offer in the future American home.

The meeting was attended by many architects, builders, and heating and air conditioning dealers. More than 200 were in attendance for the dinner which was given by the Minneapolis Gas Light Co., and the meeting which was held in their auditorium.

Mr. Knighton in discussing the historical background of year 'round comfort control pointed out that the name, air conditioning, was first suggested by Stuart W. Kramer in a book, "Useful Information for Cotton Manufacturers," written in 1909.



John K. Knighton (left), sales manager of the Air Conditioning Division of Servel Inc. confers with E. J. Boyer of the Minneapolis Gas Light Co. at the meeting.

Mr. Kramer, however, wasn't one of the first people by any means to investigate indoor climate control. In 1896 the British Parliament appointed a commission to investigate it.

"Mr. Kramer wasn't the first to investigate the possibilities," Mr. Knighton said, "but he was one of the first to outline the job at which we have been striving, and the job we have completed with the Servel All-Year Gas Air Conditioner. At that time he said the job of air conditioning should perform six things . . . heating, air moistening, ventilating, air cleaning, air cooling, and automatic regulating of humidity and temperature to a pre-determined standard."

Raceland Area Gas Plant Due

It is announced that Raceland, La., and adjacent territory will soon have a gas-distributing plant, which will be known as the Southcoast Gas Company. Organization having already been completed, a survey is presently going on in and around Raceland, where the first gas pipes will be laid. The project has been under consideration for months. With relaxation of some restrictions it is possible to go ahead with the work necessary to assure the Raceland gas plant.

CONNELLY IRON SPONGE

High in efficiency . . . low in cost. In hundreds of plants throughout the country, Connelly Iron Sponge has proven itself . . . the finest purification material on the market. Not only does it lower your purifying cost but its high activity and capacity tends to reduce distribution and service complaints because of the cleaner gas which ultimately lowers operating and maintenance costs.

If you have a problem in gas purification, Connelly's 68 years of experience is at your service. Our engineers can help you . . . there is no obligation on your part.

CONNELLY IRON SPONGE & GOVERNOR CO.
ELIZABETH, N. J. LOS ANGELES, CALIF.
3154 SOUTH CALIFORNIA AVE., CHICAGO 8, ILL.

COMPLETE GAS PLANTS

●

INDUSTRIAL FURNACES

●

THE GAS MACHINERY CO.
16100 Waterloo Road
Cleveland 10, Ohio

Cities Service Elects Watson Vice-President

Burl S. Watson has been elected a vice-president of Cities Service Co., W. Alton Jones, president, announced Feb. 22. Mr. Watson heretofore was a director of the company and has been connected with the concern or its subsidiaries since 1917. He is also director and officer of a number of petroleum, natural gas and electric subsidiaries and is in charge of Cities Service realty holdings in lower Manhattan.

Erle G. Christian, controller, was appointed secretary of the company, and Chester E. Weger will succeed him as controller. Ernest H. Johnston was elected treasurer. He has been with the organization for thirty-eight years and a director since 1916.

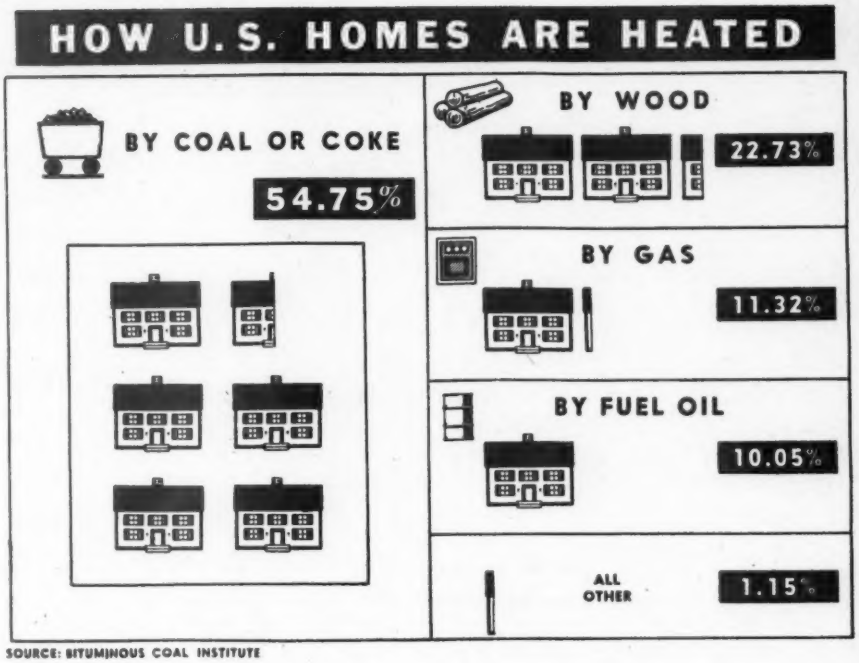
Mr. Christian joined the company in 1914 as a meter reader and was made controller in 1939. Mr. Weger has been with Cities Service since 1916 and was made manager of the budget department in 1924 and treasurer of Petroleum Advisers, Inc., in 1938.

Utility Stock Deal Gets SEC Sanction

The Securities and Exchange Commission approved on February 21st a sale of the outstanding securities of the Iowa-Nebraska Light and Power Company by the Continental Gas and Electric Company to the Central Electric and Gas Company for $4,325,000. Iowa-Nebraska Light is a subsidiary of Continental Gas. Central Electric is an operating public utility and not a subsidiary of any company.

Central Electric, after it acquires the 33,684 shares of common stock of Iowa-Nebraska Light, will become parent of the latter. The purchasing company, however, proposes immediately to acquire all the properties and assets of Iowa-Nebraska Light, to assume all its liabilities and to dissolve it. Iowa-Nebraska Light will declare and pay to Continental Gas, prior to the sale, a cash dividend of $465,000 out of paid-in surplus.

Continental Gas is an intermediate holding company in the United Light and Railways and United Light and Power Company holding company system. The commission reserved jurisdiction over use of the proceeds of the sale by Continental Gas.



I.N.G.A. of A. Opens Washington Office

The Washington offices of the Independent Natural Gas Association of America, opened recently is located in Suite 305 at 1700 I Street N. W., and will operate under the direction of John A. Ferguson, Executive Director, recently appointed.

The Association will continue to maintain its Mid-Continent offices in Oklahoma City, Okla.

Detroit Tax on Utilities Ruled Unconstitutional

Circuit Judge Joseph A. Moynihan ruled unconstitutional Feb. 6 a Detroit city ordinance intended to authorize collection of an excise tax from Detroit Edison Co. and Michigan Consolidated Gas Co. He restrained the city from attempting to collect the tax.

Pending court rulings on the ordinance, the city made no attempt to collect the tax. It was set at 20 per cent of gross revenue, but was limited to the maximum the company would have to pay in Federal excess profits taxes.

New Officers of Savannah-St. Augustine Gas Co.

Purchase of the Savannah Gas Company by Heywood Hansell Hillyer from the American Gas & Power Company became final on February 28.

On March 1, the new management took over the operation of the local company, along with that of the St. Augustine, Fla., Gas Company, as the Savannah-St. Augustine Gas Company, with headquarters here.

In addition to the present officers of the Savannah Gas Company, who will remain in their respective posts, Mr. Hillyer, who is already president and owner of the St. Augustine Company, will become president of the combined organization.

His son, Haywood Hansell Hillyer, Jr., of New Orleans, now in the U. S. Army, and Robert F. Daugherty will be vice presidents of the new company; Alex A. Lawrence of Savannah will be secretary; Granger Hansell of Atlanta, treasurer, and Harold Snedeker of Savannah, assistant secretary and treasurer.

"JOURNAL" GAS FLOW COMPUTERS

High Pressure
RANGE:
Cu. Ft. of Gas Per Hour—100-10,000 M
Diameter of Pipe—Inches ¾-30
Difference in Absolute Pressure—Lbs. per sq. in., 1-500
Sum of Absolute Pressures—Lbs. per sq. in., 2000-20
Specific Gravity—1.5-.35
Length of Pipe—Feet 100-5000
Length of Pipe—Miles 1-250

Low Pressure
RANGE:
Cu. Ft. of Gas Per Hour—10 to 500 M
Pipe Diameter—¾" to 48" (including standard and actual weight up to 4")
Pressure Loss—Inches .01-10
Length of Pipe—Feet 30-30,000
Specific Gravity—1.5-.35
Constants—1400-1000

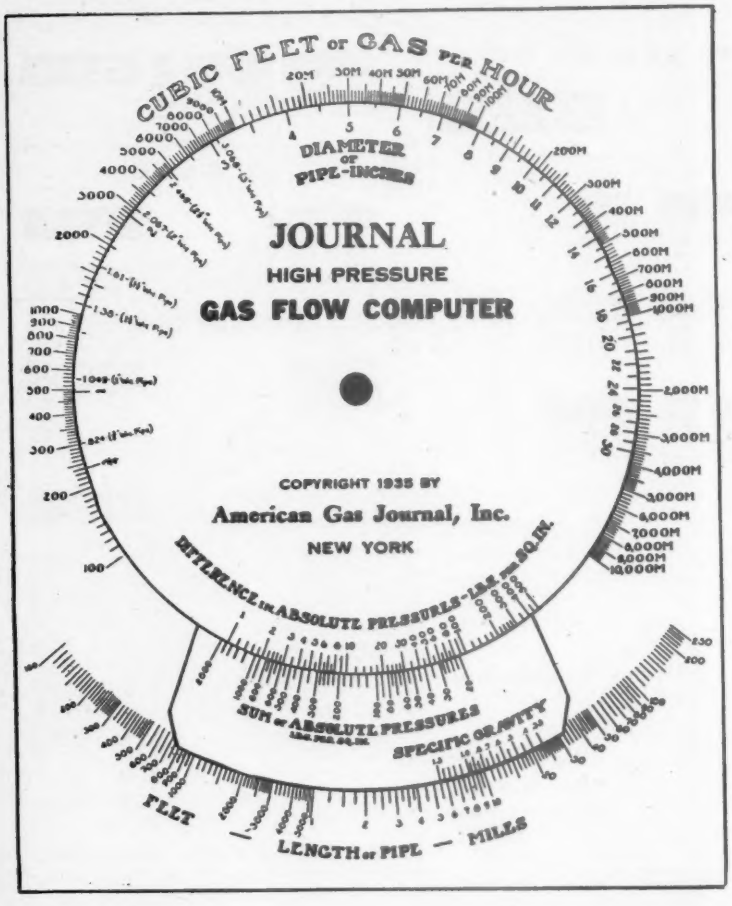
Made of durable celluloid, encased in a convenient leatherette cover with complete instructions. Actual size 6¼ x 7½

3.50 Each Postpaid

American Gas Journal
53 Park Place, New York 17

GAS PLANT EQUIPMENT
UGI REFINERY GAS REFORMING PROCESS
UGI NATURAL GAS REFORMING PROCESS
UGI HEAVY OIL PROCESS
GAS DISTRIBUTION
PIPE LINE CONSTRUCTION
THE U.G.I. CONTRACTING COMPANY
A DIVISION OF
UNITED ENGINEERS & CONSTRUCTORS INC
NEW YORK PHILADELPHIA CHICAGO
MAXIMUM RETURN TO CUSTOMER PER DOLLAR EXPENDED

"Journal" Gas Flow Computers



These Improved Gas Flow Computers are available in durable celluloid, encased in a convenient leatherette cover with complete instructions.

Actual Size 6¼ x 7½

High Pressure Computer Range:

Cu. Ft. of Gas Per Hour—100-10,000 M
Diameter of Pipe Inches ¾-30
Difference in Absolute Pressure—Lbs. per sq. in. 1-500
Sum of Absolute Pressures—Lbs. per sq. in. 2000-20
Specific Gravity 1.5-.35
Length of Pipe—Feet 100-5000
Length of Pipe—Miles 1-250

Low Pressure Computer Range:

Cu. Ft. of Gas Per Hour—10 to 500 M
Pipe Diameter ¾" to 48" (including standard and actual weight up to 4")
Pressure Loss Inches .01-10.
Length of Pipe—Feet 30-30,000
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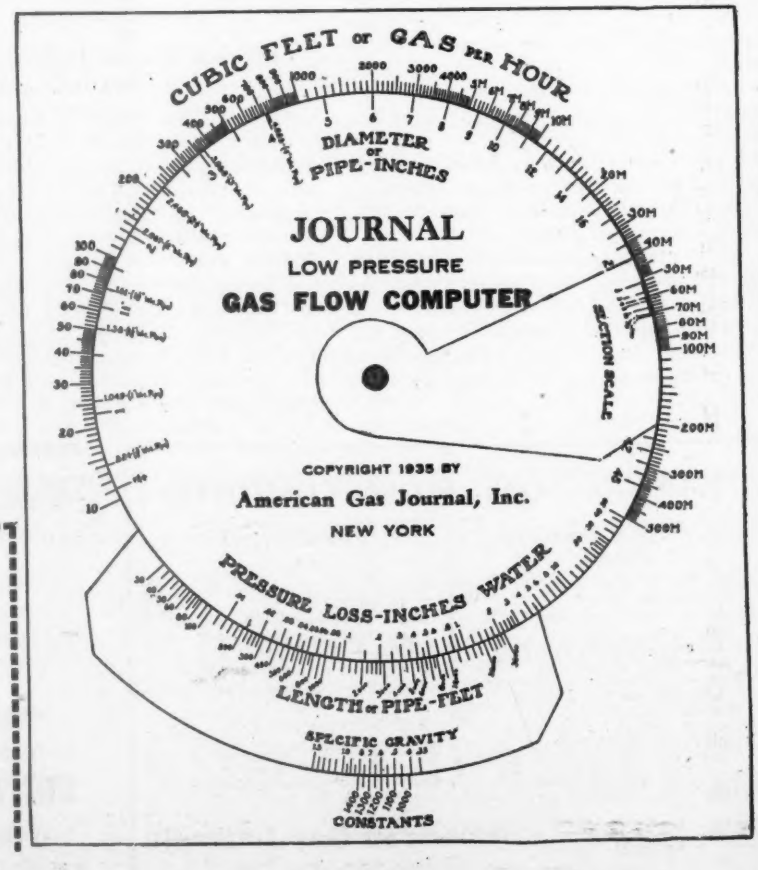

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A.G.A. Production and Chemical Committee Program

A meeting of the Joint Production and Chemical Program Committees of the A.G.A. Technical Section was held in New York, February 20, to discuss the preparation and distribution of papers originally planned for presentation at the Spring Joint Committee Conference which was cancelled last month. R. Van Vliet, Chairman of the Gas Production Committee, and Dr. C. W. Wilson, Chairman of the Chemical Committee, conducted the meeting.

To fill the gap created by the conference ban, it was decided to secure a considerable number of papers on timely subjects for publication in the A.G.A. MONTHLY and the gas trade journals. It was recommended that such papers be eligible for the Beal Medal and be made a part of the permanent record by publication in the A.G.A. Proceedings.

Separate meetings of the production and chemical groups were held in the afternoon at which time a schedule of topics and prospective authors was completed.

In addition to the Chairman, mentioned above, the following Subcommittee Chairmen were present:

W. R. Fraser, Vice Chairman—Chemical Committee, Michigan Consolidated Gas Co., Detroit, Mich.; R. F. Tenney, Chairman—New Developments Subcommittee of the Chemical Committee, Queens Borough Gas & Electric Co., Mineola, L. I., N. Y.; J. Gordon Sweeney, Chairman—"Wrinkles" Subcommittee of the Chemical Committee, The Brooklyn Union Gas Co., Brooklyn, N. Y.; C. C. Russell, Chairman—Carbonization and Coke Subcommittee of the Gas Production Committee, Koppers Co., Seaboard Division, Kearny, N. J.; J. Hawley Taussig, Chairman—Water Gas Subcommittee of the Gas Production Committee, United Engineers & Constructors, Inc., Philadelphia, Pa.; F. W. Hartzel, past Chairman of the Water Gas Subcommittee, The Philadelphia Gas Works Co., Philadelphia, Pa.; J. S. Haug, Chairman—Subcommittee on Survey of Gas, Coke, and By-Product Making Properties of American Coals of the Gas Production Committee, United Engineers & Constructors, Inc., Philadelphia, Pa.; and Dr. S. P. Burke, Chairman—Subcommittee on the Use of Oxygen in Gas Manufacture of the Gas Production Committee, Columbia University, New York, N. Y.

Lone Star Announces Personnel Changes

H. C. Davis, former manager of Lone Star Gas Co.'s Ennis, Tex., distribution district, has been transferred to the company's Abilene division, where he will develop post-war sales programs for the company. He is succeeded at Ennis by H. L. St. John, who was transferred from the Temple distribution district. George F. Peck, Jr., formerly manager of the Terrell district, was appointed to succeed Mr. St. John at Temple. B. B. Stringfellow of El Paso was appointed manager of the Terrell district.

KITSON COMPANY WINS ARMY-NAVY "E" AWARD

Officiating at the presentation ceremony, Philadelphia, February 13, left to right—Rear Admiral Wat T. Cluverius, U.S.N. (Ret.); Lieut. Colonel Hayward K. Kelley; John E. Hopkins, Foundry; Edward Loges, Clock dept.; Lieut. Gerald F. Welles, Army; and President Morse DellPlain.

SEC Permits Utility Sale

The Securities and Exchange Commission has approved transactions leading to the Associated Electric Company's sale of the Portmouth (Ohio) Gas Company. The latter will give the former company a five-year promissory note for $480,000 in payment for its indebtedness.

All common stock, 4,000 shares of Portsmouth Gas, is being purchased for $100,000 by A. L. Klees, Long Beach, L. I.; George N. Shaw, New York City, and Lawrence Thorne, Greenwich, Conn. They have informed the commission that they are prepared to exercise their option for the purchase of the note from Associated Electric, which will reduce the purchase price of the stock by $25,000.

R. E. Sprenkle Appointed Hydraulic Engineer

The appointment of Mr. R. E. Sprenkle as hydraulic engineer of Bailey Meter Company, Cleveland, Ohio has been announced by H. M. Hammond, General Sales Manager. In this capacity Mr. Sprenkle will continue to act as consultant on all problems of fluid flow and will supervise research on the subject.

Mr. Sprenkle has been associated with Bailey Meter Company for over twenty years during which time he has conducted investigations in the hydraulic laboratories of numerous engineering schools, has served for many years as a member of the A.S.M.E. Research Committee on Fluid Meters and has had a wide experience in the practical application of industrial metering equipment.

New Auxiliary Pipe Line To Conserve Gas Now Wasted

At least 76,500,000 cubic feet of natural gas which is now being wasted daily in Texas, or which is without a market, will be conserved under proposals filed with the Federal Power Commission by Tennessee Gas and Transmission Company which has recently placed its $54,000,000 Texas-West Virginia pipe line into operation.

Gardiner Symonds, president of Tennessee Gas, petitioned the Federal Power Commission for permission to connect the line with eleven Texas oil and gas fields now having no outlet, and stated that the maximum daily take may run as high as 151,000,000 cubic feet a day.

This gas would augment the reserves of Chicago Corporation, which is now supplying all the needs of the war-essential line. Chicago Corporation, with aid from the Reconstruction Finance Corporation, financed and constructed the 1,265-mile line in response to a War Production Board ruling that 200,000,000 cubic feet of natural gas would have to be brought to the six-state Appalachian industrial area every day to prevent interruption of war production this winter.

Officials of Tennessee estimate that in a ten-mile band on each side of their line in Texas, more than 200,000,000 cubic feet of natural gas is being legally wasted every twenty-four hours in the production of crude oil. Since no market for this casinghead gas exists, it is vented and burned in the picturesque and costly flares that line the Gulf Coast from New Orleans to the Mexican border.

Under the proposals filed by Tennessee Gas, a minimum of 42,000,000 and a maximum of 72,000,000 cubic feet of these petroleum vapors would be recovered every day and put to economic use. The gas would be co-mingled with the company's present supplies being pumped to the Appalachian area, where key war plants were forced to close down during cold spells in recent winters because of fuel shortages. In addition, Chicago Corporation is installing facilities at its Wardner plant to gather and deliver 12,000,000 cubic feet daily for pipe line use.

"The primary reason for connecting these new sources is the conservation of a natural resource now being wasted, and to afford a market to small, isolated reserves so that the tendency to force this gas on the market at an uneconomic expression of value will be minimized," Mr. Symonds said in his brief.

Moreover, the petition said, small gas producers and landowners in Texas will also be materially benefited by being provided with a market for gas which they would not otherwise have.

PHILANDER BETTS

Philander Betts 3d, a pioneer in the electrification of New Jersey and Pennsylvania street railroads, died Feb. 5th at his home in Belmar, N. J. He was seventy-six years old.

Mr. Betts, a native of Nyack, N. Y., studied at Rutgers College and Columbian (now George Washington) University, and entered railway construction work in the early 1890's.

He was chief engineer of the New Jersey Public Utilities Commission from 1910 to 1934, and was in charge of construction of some of the earliest electric lines in Newark, N. J., and Philadelphia between 1890-'93. That year Mr. Betts went to the Washington Navy Yard as an electrical engineer, a post he held until 1901 when he became an instructor in mechanical and electrical engineering at Corcoran Scientific School, Washington.

He enlisted as a major in the last war on July 14, 1917, and was discharged in 1918 from the Quartermaster Corps as a lieutenant colonel with a citation from the Secretary of War "for efficient service in the Construction Division of the Army." Later he was made a colonel in the Engineer Corps. He was senior past commander of both the New York and the north Jersey chapters of the Military Order of the World War, and honorable vice-president for life and member of the staff of the New Jersey State Reserve Officers Association.

R. H. DELAFIELD

Robert Hare Delafield, vice-president in charge of finance of the Columbia Gas & Electric Corporation, died February 12th at his home in Hewlett, Long Island, N. Y. He was fifty-one years old.

Mr. Delafield took charge of the utiilty corporation's financial affairs when he was thirty-seven years old.

His first business connection was with the Metropolitan Building Company, of Seattle. After a year there, he came to New York to join the National City Bank, and in 1916, when the bank organized the National City Company as a bond-investment branch, he was made one of the original personnel of that company.

He became manager of sales in the New York area within a year. In 1917 he received a commission in the Army Sanitary Corps, and later he served in France in the office of the chief surgeon. He was discharged with the rank of major in July, 1919, and rejoined the National City Company, where he remained until 1931. Five years of that time he was in charge of the Boston branch.

He then accepted the position in the Columbia Gas and Electric Corporation, which he held at the time of his death.

JOHN V. McKINNEY

John V. McKinney, prominent utilities executive, member of the Board of Directors of The United Light & Power Company and president of the Iowa-Illinois Gas and Electric Company since its inception January 1, 1942, died January 27 at his home in Rock Island, Illinois, at the age of 51.

Prior to assuming his duties as president of the newly organized Iowa-Illinois Gas and Electric Company early in 1942 Mr. McKinney had served as executive vice president of the Kansas City Public Service Company, Kansas City, Missouri, since 1926.

His wide and varied experience in the public utility field included service with the Milwaukee Railway and Light Company, Elston and Company, Northern Iowa Gas and Electric Company and William G. Woolfolk and Company, Consulting Engineers of Chicago.

C. W. SMYTHE

Charles W. Smythe, assistant general manager, gas department, Public Service Electric and Gas Co., Newark, N. J., died Jan. 31 at the age of 55.

He had been with Public Service, in the gas department, since 1912 and was successively, superintendent of the company's Front St. and Market St. gas works in Newark and its Trenton gas works. In 1924 he was promoted to assistant engineer of gas manufacture, Hudson Division, and two years later was made assistant general superintendent of gas manufacture.

PHILIP GADSDEN

Philip H. Gadsden, who retired on Jan. 1, 1942 as senior vice-president of The United Gas Improvement Co. of Philadelphia, died Feb. 27th. He was seventy-seven years old.

Mr. Gadsden's career as a public utilities executive spanned a period of more than forty years. He began it in 1900 as vice-president of the Consolidated Railway and Lighting Co., of Charleston, S. C. He was president of the company from 1903 to 1926.

He was vice-president of the Charleston Light and Water Company from 1907 to 1917 and a member of the Federal Electric Railways Commission in 1919. During the World War he was chairman of the war board of the American Electric Railway Association and chairman of the National Committee on Public Utility Conditions.

Mr. Gadsden was also chief of the Philadelphia District Ordnance Office of the War Department during the World War. He was president of the American Electric Railway Association in 1921, president of the Southern Gas Association in 1922 and president of the Eastern States Gas Conference in 1923. He became vice-president of the United Gas Improvement Company in 1919.

CHARLES M. HAMILTON

Charles M. Hamilton, in charge of the securities department of Ebasco Services, Inc., died February 21st at the age of 62.

Mr. Hamilton joined Electric Bond and Share Company, which later, in 1909, formed Ebasco to provide technical and financial services to power utilities. For several years he was secretary to the late Sidney Z. Mitchell, who founded the Electric Bond and Share Company.

C. L. BRYANT

Charles Lester Bryant, 68, original founder of the Bryant Heater Co., Cleveland, Ohio, died Jan. 29.

Although he sold out his interest in the Bryant Heater Co. many years ago, he was head of the C. L. Bryant Corp. and the Bryant Machine Products Co.

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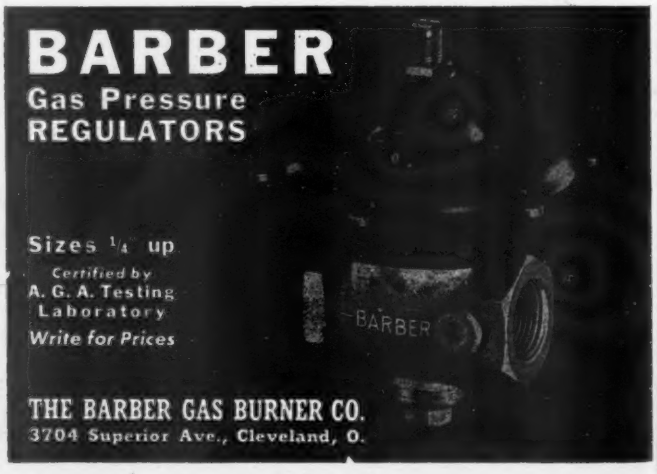

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CONVENTION CALENDAR

March

6 *A.G.A. Southwest Personnel Conference,* Shreveport, La.

8 *A.G.A. Midwest Personnel Conference,* Phillips Hotel, Kansas City.

April

(wk.) 9 *Midwest Gas Association,* St. Paul or Omaha.

9-10 *Midwest Power Conference,* Palmer House, Chicago.

17-19 *Southwestern Gas Measurement Short Course,* Norman, Okla.

May

7-11 *National Fire Protection Association,* Annual Meeting, Palmer House, Chicago, Ill.

June

19-22 *Canadian Gas Association,* Victory Convention, Murray Bay, Quebec.

Cooper Bessemer Appoints Myers to Capital Staff

Appointment of Walter F. Myers to the staff of the Washington office of The Cooper Bessemer Corporation is announced by Stanley E. Johnson, General Sales Manager.

Mr. Myers brings to the company a broad experience in the equipment and Diesel field, having served during the past 25 years as sales engineer, construction engineer and consulting engineer for public and private corporations, including the Fairbanks Morse Company, the Federal Power Commission and the United States Maritime Commission.

He will assist Charles G. Cooper, director of the Cooper Bessemer Washington office in the handling and supervision of government contracts and sales and service in the Southern Atlantic States.

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War Production Board and Other Administrative Orders

Office of War Information

Conservation of Propane

Deputy Petroleum Administrator Ralph K. Davies stated on February 14th that increasing demands for propane as fuel in war plants and serious shortages of all types of transportation facilities have made it necessary for the Petroleum Administration for War to take three steps to conserve propane:

1. Applications for new installations of equipment using propane will not be approved.

2. Applications for the installation of equipment used to connect propane-consuming appliances with existing liquefied petroleum gas systems will not be approved.

3. Liquefied petroleum gas dealers now must apply to PAW for authorization to install or reinstall any type of used L-P gas equipment for purposes other than maintenance and repair. Applications of this type should be submitted to PAW on Form WPB-809. Action calling for the PAW authorization was taken by amending War Production Board Limitation Order L-86, which rescinds sub-paragraph (d) (3).

Previously, dealers were permitted to reinstall gas equipment that had been installed and in actual use prior to April 1, 1942, and which was removed from use after that date.

The first two of the three steps taken by PAW apply throughout the country except in the West Coast States (PAW's District 5), where problems of propane supply and transportation are less acute and the Pacific war demand for other types of fuel from this area can be aided to a large extent by the installation of propane-consuming equipment. The third step is applicable throughout the United States. Similar measures to conserve butane already are in effect in all five PAW Districts.

Except in the West Coast States, liquefied petroleum gas operators cannot purchase gas cylinders for new installations.

Mr. Davies explained that much liquefied propane gas is distributed in pressure cylinders by trucks to domestic users for water-heating and cooking purposes. The cylinders that are being filled while others are in use are known as "floating stock."

Since cylinders becoming idle as a result of inactive installations or consumers' cancellations can no longer be reinstalled, Mr. Davies said that these cylinders should immediately be placed in the distributors' "floating stock" to alleviate inadequate transportation and storage facilities.

Mr. Davies emphasized that the shortage of pressure tank cars, tank trucks, truck parts, tires, and manpower is serious and has a pronounced limiting effect on the distribution of propane. He said that it is becoming impossible to meet both domestic and industrial demands for the liquefied gas.

Office of Price Administration

The newly appointed industry advisory committee representing manufacturers of gas-fired furnaces recently held its first meeting with officials of the Office of Price Administration in Washington, D. C., OPA announced on February 13th.

The following officers were elected:

Chairman, F. C. Packer, Asst to President, Payne Furnace Co., Beverly Hills, Calif.

Vice Chairman, Arthur Wrieden, General Manager, Lennox Furnace Co., Syracuse, N. Y.

Secty.-Treas., C. B. Kuhn, Secretary and Treasurer, Coleman Lamp and Stove Co., Wichita, Kan.

Others attending the meeting were:

C. O. Butler, President, Mayflower Conditioners, Inc., St. Paul, Minn.

E. M. Bricker, Sales Manager, Fraser and Johnston Co., San Francisco, Calif.

Arthur Martinsen, President, Hammel Radiator Engineering Co., Los Angeles, Calif.

Gordon Rieley, Vice President, Bryant Heater Co., Cleveland, Ohio.

James R. Scott, Asst. to President, L. J. Mueller Furnace Co., Milwaukee, Wis.

Representatives of the industry said at the meeting that the majority of manufacturers of gas-fired furnaces were primarily engaged in war work. The discussions were centered chiefly around the problems and methods of operation peculiar to the supply of this type of commodity during the present war emergency and that will confront the industry during the post-war reconversion period.

Bellamy Heads Industrial Research

Charles R. Bellamy, Chief Engineer, Gas Department, Columbia Gas and Electric Corporation, and Vice President, Columbia Engineering Corporation, has been appointed by J. French Robinson, President, American Gas Association, to the chairmanship of the Committee on Industrial Gas Research, succeeding John W. Batten of Detroit.

Mr. Bellamy, who is a graduate of Lafayette College in Chemical Engineering, has been a member of the Industrial Research Committee for three years, and previously was Chairman of the Joint Committee on Gas Summer Air Conditioning of the Industrial and Commercial Gas Section and Residential Gas Section. He is a member of the American Institute of Chemical Engineers.

The Association's research in industrial and commercial gas utilization has been conducted on a moderate scale in recent years. Plans are now being made to greatly enlarge the work in anticipation of the period of reconversion of war production plants and of the postwar period.

Mr. Bellamy is eminently fitted to lead this important work for the industry. He has had extensive experience in directing research in various fields including industrial gas utilization. For twelve years he did engineering work for Semet-Solvey Company in different parts of the country. During the latter part of this period he was Gas Engineer for all Semet-Solvey plants.

As a private consulting engineer from 1923 to 1929 he specialized in gas manufacturing problems, coke oven design, and designed several of the largest benzol plants in the country. His list of clients reads like a "Who's Who" of American industry. His work with Columbia Gas & Electric began in 1929.

Serving with Mr. Bellamy on the Committee on Industrial Gas Research will be the following: Karl Emmerling, The East Ohio Gas Co., Cleveland, Ohio; John B. Frost, The Brooklyn Union Gas Co., Brooklyn, N. Y.; Charles C. Krausse, Consolidated Gas Electric Light & Power Co. of Baltimore, Baltimore, Md.; J. P. Leinroth, Public Service Electric & Gas Co., Newark, New Jersey; E. F. Schmidt, Lone Star Gas Co., Dallas, Texas; R. G. Taber, Atlanta Gas Light Co., Atlanta, Ga.; Eugene D. Milener, Secretary, American Gas Association, New York, N. Y.

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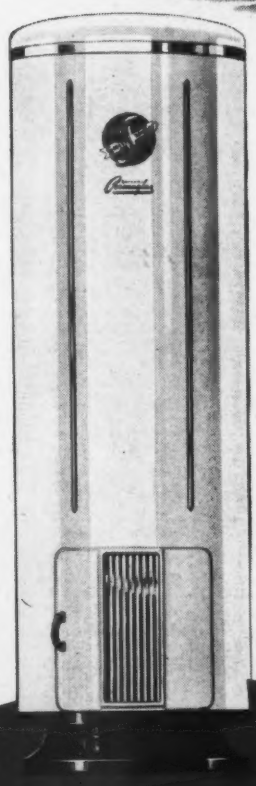

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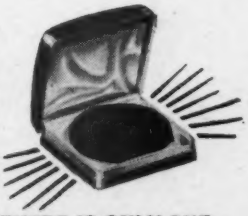

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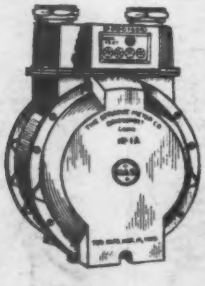
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